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CAWP Centre for Advanced Wood Processing

The Japanese Market for Wood Flooring and Wood Windows

Prepared for and with financial assistance from
Forest Renewal BC

FOREST RENEWAL BC

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Executive Summary

Background

This study collected data on the wood flooring and wood window market in Japan with a focus on the structure of the Japanese flooring and wood windows industry, and product and quality attributes of both products. Results are based on secondary sources, exploratory interviews with association representatives in Japan, and interviews with thirteen Japanese house builders. These builders included both single-family, detached house builders and construction companies building collective housing (condominiums). The detached homes were all wood houses and most of them were built using two-by-four construction. The sample of thirteen house builders represents about 2.6 percent of the total residential housing market.

Of the 1.2 million housing starts in 1998 in Japan, about 45 percent were wooden structures with most of them built using the traditional post-and-beam construction. Although the absolute number of two-by-four construction projects fell in 1997 and 1998 with the overall decrease in housing starts, its share of total residential construction remained stable at five to six percent, and both domestic and imported two-by-four housing are expected to increase. Wood windows and solid wood flooring are generally installed more often in two-by-four built homes than in other construction types. The life span of houses in Japan is short compared to western countries, but remodelling and repairing is becoming more common and houses built today are usually designed but not necessarily constructed to last longer than in the past.

The Government Housing Loan Corporation (GHLC) finances more than half of the newly built single-family detached houses. One way for building products (such as windows and flooring) to gain acceptance for use in house construction is to be listed on the GHLC specification list. This list is a de facto quality certification system for small house builders who usually use GHLC listed building products to lower their own responsibility for product defects. Large house builders do not generally rely on the GHLC list; instead, they have their own standards and product testing. Two organisations funded by Japanese industry and associations, the Japan Housing and Wood Technology Center (HOWTEC) and Better Living, evaluate building products for being added to the GHLC specification list.

Wood is the material traditionally used in Japanese houses for interior finish, but its usage has declined with the introduction of substitute materials. Currently, wood is making a comeback, partly due to the use of wood in imported and western-style houses, a high prestige value for wood and increasing concern with indoor air quality.

Flooring

Wood is the most popular flooring in Japan followed by carpet and vinyl. Almost 95 percent of the wood flooring market is composite flooring and only 5.5 percent is solid wood flooring. Solid wood floors are usually installed in public and commercial buildings, while composite flooring is typically used in residential housing. Demand for solid wood flooring in residential houses has recently increased in conjunction with more two-by-four and western-style homes. The typical composite

flooring system is made of tongue-in-groove plywood overlaid with hardwood veneer, both mostly imported from Southeast Asia. The size of the pre-assembled, pre-finished (polyurethane) panels is typically 303 x 1818 mm and 12 to 15 mm thick.

The Japanese composite flooring industry and solid wood flooring industry differ in structure; manufacturers of composite flooring are very large companies located mostly on the main island of Honshu and close to the urban centres. Most of these companies do not have a background in wood products. The solid wood flooring industry consists of small manufacturers in northern Japan (Hokkaido and northern Honshu) who use local wood species and a small quantity of imported timber. The Japan Composite Flooring Industry Association and the Japan Solid Wood Flooring Industry Association represent interests of the Japanese manufacturers.

The most important results of the survey were:

- 50 percent of the respondents had 3 to 5 flooring suppliers.
- Thin solid wood/veneer on plywood base was the single most important flooring type with 55 percent of all installed flooring. Solid hardwood was the next important with 17 percent. Solid softwood had only a share of 2 percent.
- In most areas of the house, wood flooring was the most preferred type of flooring, except for the entrance and bathroom.
- Solid wood was preferred in the hall, living room and dining room.
- Plywood base wood flooring was preferred over solid softwood flooring.
- Respondents preferred light colour wood floors.
- Knots were acceptable in solid wood if they match the design of the house.
- Toxicity of the components was a very important issue.
- It was very important that the flooring is ready to install. All respondents used primarily plywood base flooring which comes in 300 x 1800 mm planks.

Recommendations

The Japanese market for wood flooring is very large and competition from Japanese manufacturers is intense in the composite flooring sector.

- For both solid and composite flooring, the best opportunities exist for light, colour-matched floors with a polyurethane finish. Only some customers desire knots.

- It is essential that the flooring is ready-to-install; i.e. pre-finished and pre-assembled to panels. This poses no problem for composite flooring, but pre-assembled or easy to assemble solid wood flooring products have to be developed.

- There is potential for the newer 10-12 mm snap together solid wood flooring, which results in a floating floor but is suitable for refinishing. This would drive down the material supply cost due to the narrower width as well as the installation costs since nailing is not required.

- In the growing solid wood flooring market, moderately priced softwood flooring may have good possibilities. Because softwood is generally not regarded as being hard enough, it should be hardened or at least have a very hard finish.

- The medium to low-priced flooring market is a good target for paper laminate flooring since laminate flooring has not entered the market on a large scale. Greater hardness and good appearance could overcome consumers' preferences for veneered surfaces.

Windows

Japan's window market is dominated by aluminium (>90 percent), followed by vinyl (8 percent) and wood (<2 percent). The largest market for vinyl and wood windows is Hokkaido where a colder climate makes insulating properties more important and low population density does not require compliance with the fire regulations. While vinyl and aluminium windows are mainly from domestic production, most wood windows (about 80 percent) are imported. Sliding windows account for the majority of the Japanese window market (about 60 percent), according to a survey by the Japan Sash Association. About 40 percent are western-type windows (casement, double-hung, awning, bay windows etc.) that are mostly installed in western-style houses.

As house openings, windows are subject to the strict fire regulations in areas zoned as fire zone or quasi-fire zone, which is the case in most urban areas. The fire regulations have promoted the use of aluminium for windows, since aluminium windows can be certified as fire door/window under a group approval system, while wood windows have to be tested individually. The proportion of newly built houses outside of fire and quasi-fire zones should increase, since the population shift from rural to urban areas reversed in the early nineties and now more people are moving to rural areas.

The use of wood windows is closely connected to the construction of western-style houses; with the increase in two-by-four homes and other western-style houses driving the demand for wood windows. In response, Japanese manufacturers recently started producing western-type wood windows. In traditional post-and-beam houses, however, aluminium windows are dominant.

Japanese wood window manufacturers are small companies that use mostly imported timber and expensive European tilt-and-turn hardware, with a focus on the upper-end market. Recently, a Japan Wood Window Association has been formed.

The survey among house builders showed:

- Most respondents purchased from only 3 to 5 window suppliers.
- 80 percent of the windows were made of aluminium.
- 13 percent of the windows were made of wood or wood combination material (aluminium-wood, vinyl-wood). This relatively high percentage is related to the fact that many of the respondents build two-by-four homes which use wood windows more frequently than traditionally built houses.
- Half of the houses built required fire-rated doors and windows.
- Windows which contain no toxic components was a very important attribute for the respondents, more important than design, fire-rating, or delivery service.
- 45 percent of the windows installed were double-sliding windows. All other window types have shares of less than 20 percent.
- The share of double-sliding windows was expected to decrease slightly in favour of casement and double-hung windows.
- Water infiltration was a major problem with windows imported from North America.
- Respondents who did not use wood windows would not use them in the future.
- The finish on the inside of the house should be clear, the colour light.
- No visible knots were allowed.
- 70 percent of the respondents preferred aluminium-clad wood windows over wood windows or vinyl-clad wood windows.

Recommendations

- There are opportunities for aluminium-clad wood windows in the high-end market for design-, health- and environmentally conscious house buyers.
- Taking advantage of the present promotion of energy-saving housing, wood windows, at affordable prices with heat insulation (according to the GHLC specifications), have better chances of success than in the past, especially with the increasing westernization of Japanese homes.
- The typical Japanese double-sliding window is still the single most widely installed window today and is available on the market only in aluminium. To obtain a significant share of the window

market, wood window producers should develop double-sliding windows in wood or wood combined with aluminium.

In order to gain market acceptance of wood windows, producers must be careful to deliver good quality and to consider quality problems specific to Japan, such as water infiltration.

Quality Certification

The following key results were obtained from the survey:

- 70 percent of the respondents would like to purchase wood interior finish products that are certified by a quality assurance program.
- Exterior doors, interior doors, and windows are the products they would like to see certified.
- 90 percent find product quality more important for a quality assurance program than quality in the process.
- Half of the respondents expect from quality certified products that they meet certain standards and have a stable quality. The other half expects good after-sales service.
- Durability, performance, and reliability are the most important factors in defining quality for windows, and flooring. Features and perceived quality are of relatively low importance.

Recommendations

A Canadian quality certification program as it is being developed for the wood products industry would be an effective marketing tool for windows. For flooring, quality certification would probably not be as effective, but would serve to increase consumer confidence in new products. For full market access, however, products should be on the GHLC list, which means co-operation with current Japanese suppliers and their associations.

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Introduction

Background of the Study

There is a growing interest in Japan for the use of finished wood products in flooring and window applications. This report presents information on these Japanese markets based on the results of interviews with house builders in Japan conducted in September 1998. Results from the FRBC/Forintek project on Japan's value added market[1] indicates strong growth for wood flooring in residential housing in Japan over the next three years. This report provides additional detailed information about the Japanese market for both wood flooring and windows, to better aid BC producers in considering entry into this highly competitive market. The original FRBC/Forintek study indicated that product certification can be used as a marketing tool for consumers and builders in Japan. This perception of quality certification, specifically with respect to flooring and windows, was investigated for the Wood Products Quality Council of Canada at the Centre for Advanced Wood Processing.

Objectives

The main objectives of this study are:

1. To provide market data on important product attributes of wood flooring and wood windows. These attributes include size, wood texture, colour preferences, quality considerations and quality certification;

2. To describe the industry structure for both product groups in Japan to better understand the competitive nature of this market; and,

3. To determine the volume of wood flooring and wood windows consumption in Japan.

Market information and data regarding industry structure was obtained from secondary sources and from interviews with flooring and window associations in Japan. Exploratory information on product attributes was collected in direct interviews with house builders in the Tokyo region. The interview results are given in the Survey Results sections for flooring, windows and quality certification.

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[1] Cohen, David H., and Christopher Gaston. Japan's Value Added Market: Wood Products Attributes and Competition. Forintek Canada Corp., prepared for Forest Renewal BC, 1998.

Background to the Japanese Housing Market

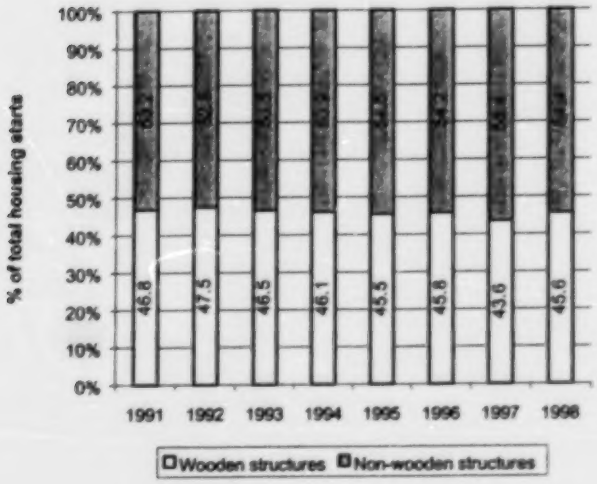
Size of Housing Market and Life Span of Housing

The Japanese housing market is second only to US housing in terms of number of housing starts per year based on 1997/98 data. Annual housing starts in Japan have declined from over 1.6 million in 1996 to 1.2 million in 1998, the lowest number in the last nine years (Ministry of Construction 1999). The 3 percent sales tax hike in April 1997, the economic recession, deregulation programs affecting financial, business, and corporate institutions, and government's restructuring programs all continue to contribute to home buying insecurity (Bean and Masaoki 1998). Figure 1 shows the total number of housing starts and the number of units constructed in wood. About 45 percent of all housing starts are wooden structures, mostly used for single-family detached homes (Theisen and Dirks 1996). Detached houses are generally built using one of the following construction methods: post-and-beam, two-by-four platform frame construction, or from prefabricated components. The share of traditional post-and-beam built housing has been eroded by, mostly, non-wooden prefabricated homes and, more lately, two-by-four construction (Figure 2). The size of houses has grown and is now equivalent to European house sizes (Figure 3, Figure 4).

To increase investment in housing in 1999, the government proposed a reduction of the Government Housing Loan Corporation (GHLC) mortgage interest rate, an increase in the tax deductible housing loan interest, an expansion of the lending limit (especially in highly populated areas), relief measures for lenders who have difficulty with loan repayment, and an extension of the application period ("An Emergency Measure..." in Japan Lumber Reports 1998). The goal is to increase housing starts in 1999 to close to 1.4 million. Home financing by the GHLC is expected to increase by 1.2 trillion Yen (Outline of Emergency Economic Package 1999). Without these additional incentives for house construction, investment in housing is be expected to decline, especially with many borrowers starting to pay back high payments following a 5-year period of very low payments under a special GHLC loan program started by the government in 1993 ("Japan's Economy." in Economist 1998).

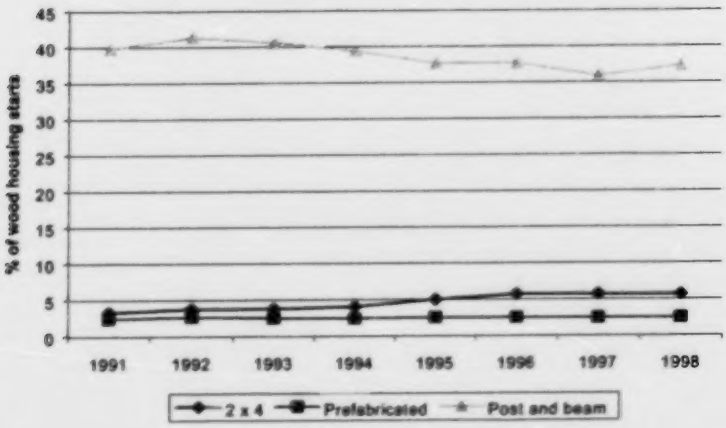
One important reason for the size of the housing market is the short life span of houses in Japan (26 years) compared to the USA (44 years) and the UK (75 years) (A Quick Look at Housing in Japan 1998). Low quality housing built after the Second World War contributed to a short life span of houses in Japan (Jahraus and Cohen 1997). Additionally, housing has traditionally been regarded as something temporary, comparable to furniture in Western civilisations. Because of the frequent earthquakes and typhoons, houses were often destroyed and had to be rebuilt. Housing built today is designed to last much longer and most house builders advertise the life span of their houses to be 50 years. However results from recent surveys indicate that the impetus for replacing existing houses for a third of consumer respondents in 1998 was to change style and not due to problems with durability (Cohen and Gaston 1998). Housing products, such as flooring and windows, are often not repaired or replaced during their life since they are expected to last the entire life span of the house. It has been common to demolish older houses and build new homes, but repairing or remodelling of older homes is increasing (Cohen pers. com.). Thus, the use of building products for replacement purposes in remodelling is expected to increase in the future.

Figure 1: Housing starts by structure, 1991-1998



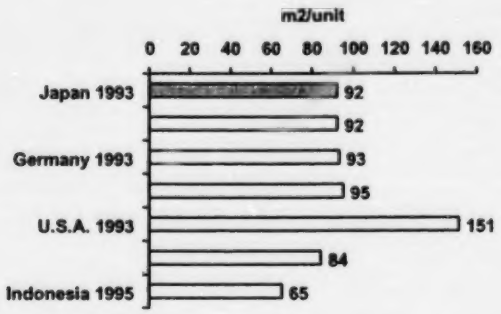
Source: Ministry of Construction

Figure 2: Two-by-four, prefabricated and post-and-beam construction as percentage of wooden housing starts, 1991-1998



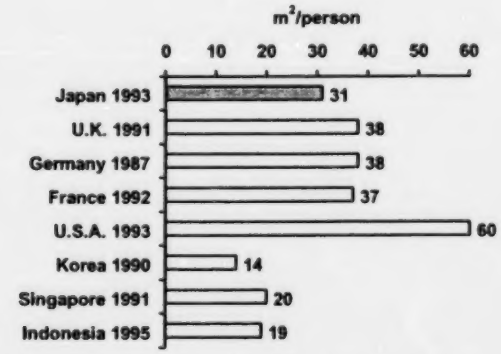
Source: Ministry of Construction

Figure 3: Floor area per unit by country (detached and collective housing)



Source: Ministry of Construction, Housing and Urban Research Institute, and Housing and Urban Development Corporation

Figure 4: Floor area per person by country (detached and collective housing)



Source: Ministry of Construction, Housing and Urban Research Institute, and Housing and Urban Development Corporation

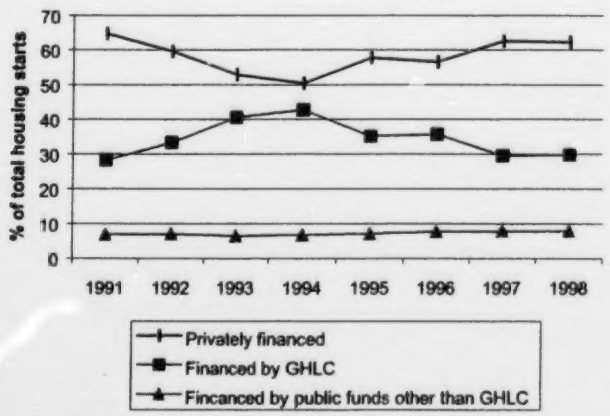
Home Financing

Home buyers can either finance their new homes either privately or with public financing. The single most important public source of financing is the Government Housing Loan Corporation (GHLC). The GHLC was set up to provide long-term, low-interest housing loans which banks and other financial agencies could not provide, with the goal of promoting house construction (Ministry of Construction et al. 1998). Figure 5 illustrates the types of financing for new homes built from 1991 to 1998. About 35 percent of all newly built houses were financed by the GHLC in 1998. Funding is expected to increase by 1.2 trillion Yen (Outline of Emergency Economic Package 1999). GHLC financing is especially important in houses built by owners (owner-occupied housing) and houses built

for sale, both of which are mostly single-family detached houses. At least 55 percent of all single-family detached housing starts are financed by the GHLC (Ministry of Construction et al. 1998). Housing for rent and company-supplied employee housing are mostly privately financed. For home buyers using GHLC financing, a GHLC loan covers about 60 percent of the total costs of the house. The amount of the loans is determined by the following factors: floor area, region in which it is built, house structure, and income of the home buyer. The GHLC operates also on a regional level so that prefectures can carry out housing policies suitable for the local communities. A special program for wooden houses (and particularly post-and-beam houses) has been started in October 1998, in which up to ¥5 million are added to the loan per house, if it meets the standards set by the regional GHLC agencies ("Government Housing Loan Launches..." in Japan Lumber Journal 1998).

The GHLC supports good quality building materials and products and thus influences the selection of building products used in construction. It is interesting to note that increased durability requirements for traditional post-and-beam wood construction in Japan are not the result of dramatic changes to the Building Code, but due to significant changes to the GHLC qualifications for mortgage assistance. Since October 1998, to qualify for a GHLC loan the house construction must meet specifications regarding the durability of the house structure ("durability type house") and one of the two following specifications: 1) "barrier-free type house" (for the elderly and wheelchair accessible, e.g. no differences in floor levels), or 2) "energy-saving type house". Previously only one of the three construction types (durability, barrier-free, energy-saving) had to be met to qualify for a GHLC mortgage (Japanese Government Housing Loan Corporation Building Manuals 1998).

Figure 5: Financing of newly built housing, 1991-1998



Source: Ministry of Construction

Listing of Building Products

There is a complex system of certifying building materials and products for use in traditional post and beam houses in Japan. This section synthesises information regarding this system gathered from informal interviews with Canadian and Japanese business representatives working in supplying the construction sector in Japan, house builders in Japan and members of the Canadian Consulate in Tokyo in both 1997 and 1998.

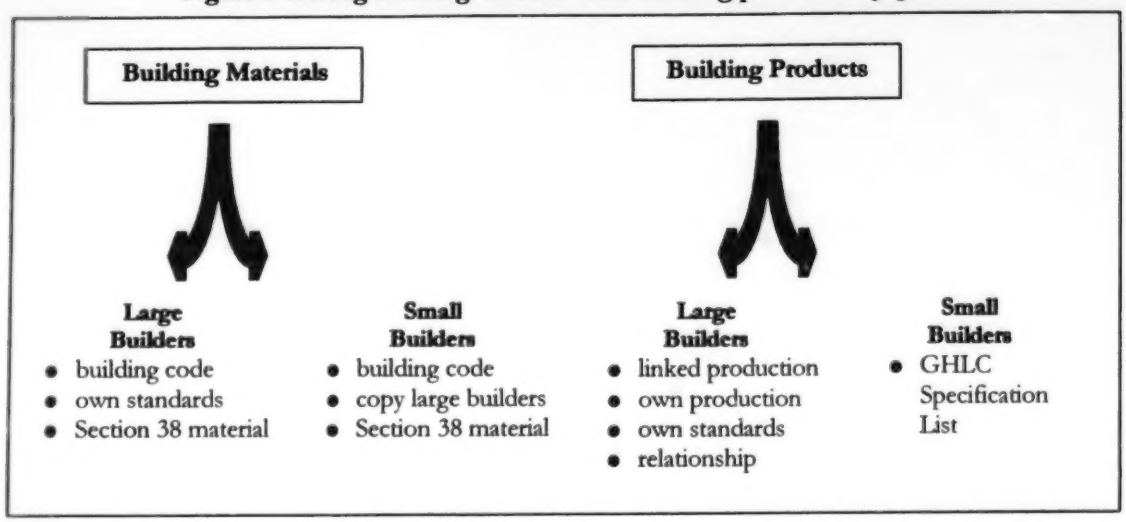
In Japan, the vast majority of the post and beam (traditional) wood houses are built by the kômuten, Japanese carpenters and house builders who construct less than 100 houses per year. It is typical for these builders to offer very comprehensive five-year warranties for their Japanese customers. In addition, these builders rely mostly on word of mouth and personal references to continue to obtain contracts to build houses and many take some responsibility for up to 10 years. This responsibility covers not only major items such as superstructure, roof and walls but also finish items such as flooring, windows and cabinets. Thus, carpenters are very concerned both with the durability and maintenance requirements of products they use in house construction. This factor, combined with the lack of a "repair and remodelling" culture requires the careful selection of materials by these kômuten when building houses.

Since the houses built rely on techniques and some materials that date back thousands of years, there is little government regulation controlling the selection of materials or the details of the construction method. This leads to little regulation concerning the choice of materials for construction, as long as they meet some general grading guidelines. The large factory-based builders often set their own exclusive standards and test materials in-house based on these proprietary requirements. Smaller builders rely on the GHLC Specification List (the List). For imported products, usually not on the list, the GHLC list poses a major barrier to market entry. The rest of this section will discuss the complex method of how building products are put on this list.

Figure 6 shows the two types of materials and the various means of gaining acceptance for use in the construction of Japanese houses. Building materials are the commodity products that are used in constructing a house, while building products tend to be the more finished goods that go into the house.

To select building materials, the smaller builder follows one of three criteria. The building code, which does not specify materials in detail, does require certain materials to be graded by an accredited organization according to the Japanese Agricultural Standards (JAS). The second method of material selection for the kômuten is to copy the material selection of larger builders, who develop and apply their own proprietary standards and often are the innovators in adopting new materials or products. A producer of a specific product can apply for a specific exemption from the building code, referred to as a Section 38. This third way of selecting material requires much detailed technical information and are not only very product-specific but also costly and time consuming for the producer of the product.

Figure 6: Listing building materials and building products in Japan



For building products, the small builder uses the GHLC specification list as a de facto certification system. They assume that if it is on the list, then their customers will not hold them responsible for any problems or defects, but rather transfer that responsibility to the government and its agents, the GHLC. This means that producers of building products consider the placement of those products on the list as a necessary step to develop measurable market share among small builders of predominantly traditional wood houses.

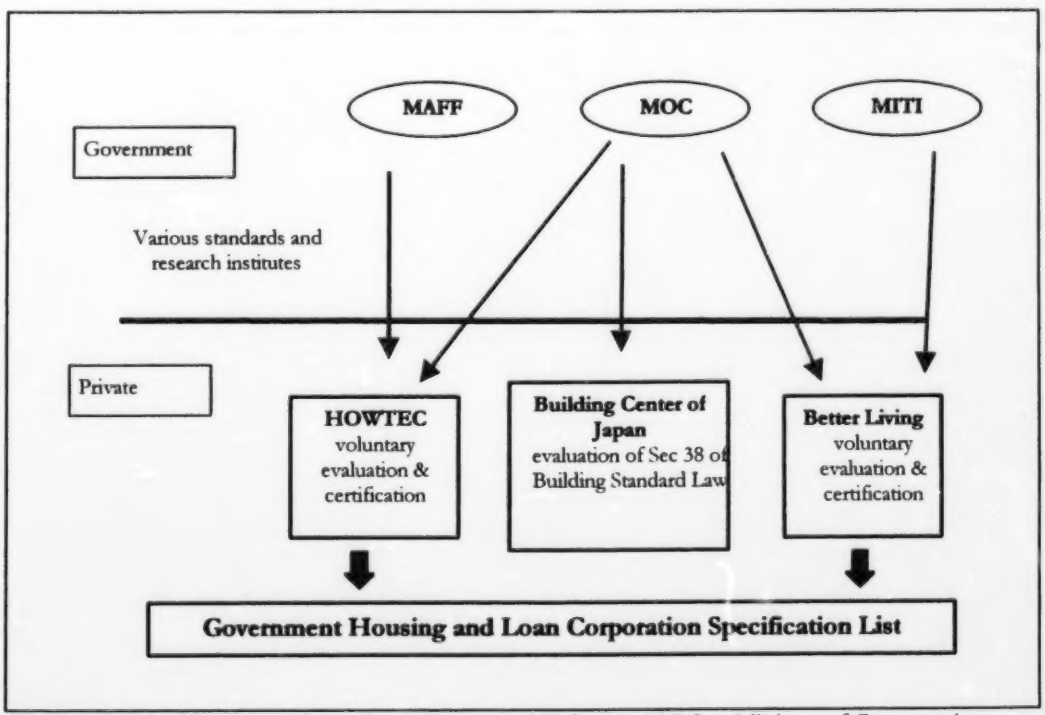
There are three organizations that are involved in approving building materials and products for use in Japanese wood house construction: The Building Center of Japan, the Japan Housing and Wood Technology Center (HOWTEC) and Better Living. New building materials that have to be approved by the Ministry of Construction go through a technical appraisal system carried out by the Building Center of Japan. This organization tests wood materials to be exempted from requiring a JAS stamp (section 38 of Building Standard Law of Japan). This paper focuses on HOWTEC and Better Living, two organizations, which evaluate building products. Both are voluntary organizations funded by Japanese industry and their associations. The GHLC almost always follows the recommendations of these two organizations regarding the addition of products to the GHLC list, as long as the recommendation is accompanied by sufficient test data.

Each organization usually has a member of one of the key ministries as its executive director. This provides a link between individual companies, their associations and the appropriate ministry in government. It is common for certain senior level bureaucrats within each Ministry to retire between ages 50 and 55. These are the people who have served the bureaucracy well but will not be promoted to the very top level of that Ministry. In Japan, they are commonly referred to as "Old Boys from Ministry of _____ ". They often become the senior administrators of organizations such as HOWTEC, The Building Center of Japan and Better Living. For example, it is usual for an "old boy" from either the MAFF (Ministry of Agriculture, Forestry and Fisheries) or the MOC (Ministry of Construction) to head HOWTEC. They provide a human link between the powerful Japanese

government bureaucracies and the industry associations directly impacted by these bureaucracies. Linkages are shown in Figure 7.

HOWTEC, which is supported by MAFF and MOC, tests building materials. This includes many of the new wood species and products as well as windows, doors and engineered wood products. HOWTEC tends to have a strong focus on construction materials and wood in particular. Their testing and recommendations lead to products being added to the list. Better Living tests building products. This includes appliances, electronics, plumbing and also windows and doors. Their testing and recommendations also lead to products being added to the list. These organizations have substantial power for firms trying to introduce new products for use in the Japanese traditional wood housing market since being on the GHLC list is a de facto certification for small builders to use these products.

Figure 7: Linkages in product listing



Note: MAFF = Ministry of Agriculture, Forest and Fisheries; MOC = Ministry of Construction; and MITI = Ministry of International Trade and Industry.

Wood Usage in Interior Finish

Solid wood is the traditional material for interior finish in Japanese houses. When substitute materials became available, the use of wood decreased because of perceived advantages of substitute materials, especially in products connected to the exterior of the houses such as windows and doors. Other factors leading to a loss of interest in wood are lower prices of substitutes and the desire to use "new" products (Schaffer 1996).

Recently, wood has again become popular as a finishing material. Survey results show that solid wood is currently a prestige product and the most preferred material for interior finish. Consumers, designers and builders clearly all prefer wood over wood veneer, plastic and metal for finishing products (Cohen and Gaston 1998). A high preference for solid wood over gluelam, wood veneer and plastic was also found in a survey among house builders (Schaffer 1996). Although wood was traditionally used in Japanese interior finish, much of its current popularity comes from imported interior finishes and imported housing.

Wood is seen as a high-end finishing product, but knowledge about wood properties and species seems to be limited among house builders (Schaffer 1996). It was also found that the use of solid wood or other materials was more important than the actual wood species used. The use of wood, and especially of solid wood, is higher in upper-end uses. In Japan, the share of upper-end houses with a high proportion of solid wood finish is estimated to be somewhere between 6 percent and 30 percent (Schaffer 1996). As house prices decline, more reconstituted wood products and substitutes are used in interior finish. In lower-end houses, wood is used in obvious locations such as flooring in the entrance, living and dining areas, doors close to the entrance, and stairs (Schaffer 1996). Wood is clearly preferred in interior finish from the perspective of prestige, but price is the reason why house builders do not use wood more often.

Methods

Survey Design

This study was based on a sample of residential house builders and construction firms in Japan. The survey respondents were designers within the residential building companies. Since a previous survey *on interior finish* had been conducted among small builders[2], large builders were the main target in this study in order to check if the results of the previous survey are the same for large builders. Moreover, large builders are supposed to lead the way in house design.

The survey was conducted by means of personal interviews (through translators) with company respondents in Japan. For this reason, the number of companies interviewed had to be relatively small. Interviews deliver more complete responses than other forms of data collection and much qualitative information can be obtained this way (Zikmund 1997). The companies were selected through a distributor of Canadian building materials in Japan (Interex Japan). A sample of 13 builders was interviewed in the Tokyo area during two weeks in September 1998. The Tokyo area is, followed by Osaka, the most populated area in Japan and therefore the largest housing market. A fourteenth company in the sample could not be interviewed.

The survey focused on two topics: First, attributes of wood flooring and windows, and secondly, the perception of quality and the importance of quality certification of interior finish products. The questionnaire was developed based on two previous surveys, one on interior finish in Japan[1] and another on quality and quality certification among secondary wood processing companies in British Columbia[3]. The questionnaire was pre-tested by individuals in the university and industry. The final version was translated into Japanese and faxed to the respondents prior to the interviews.

Profile of Survey Respondents

The size of the companies interviewed is shown in Figure 8 in terms of number of units built per year. Three of the respondents were large builders and the rest were either medium-sized or small builders. Three of the companies were construction companies building collective housing, while nine were detached house builders. One respondent was not a builder but did interior finish and design. The total number of units built by the twelve house builders in 1997 was 30,570 or about 2.6 percent of the total housing starts in Japan for that year (1.2 million). Approximately, two thirds of the 30,570 units built were detached houses (Figure 9). All of these houses used wood as the main construction material while the majority was built using two-by-four platform frame construction method (Figure 10).

Because of the small sample size (representing 2.6 percent of the total residential housing market), the survey results must be regarded as qualitative, exploratory information.

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[2] Cohen, David H., and Christopher Gaston. Japan's Value Added Market: Wood Products Attributes and Competition. Forintek Canada Corp., prepared for Forest Renewal BC, 1998.

[3] Secondary Wood Products Industry Needs Survey (by R. Kozak, Centre for Advanced Wood Processing UBC)

Figure 8: Number of housing units built per year by respondents in 1997

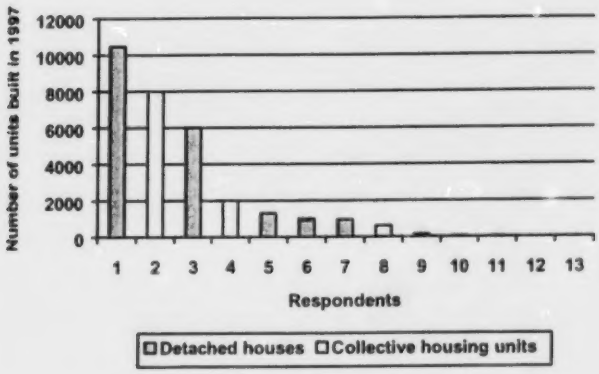
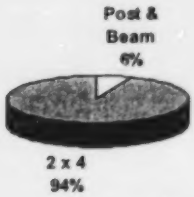


Figure 9: Proportion of detached houses (wooden structures) and collective housing units (non-wooden structures) built by respondents in 1997

Figure 10: Building method of detached houses (wooden structures) built by respondents



Flooring Market

Overview on the Flooring Market

The main flooring materials used in Japan are wood flooring, carpet, vinyl, and tatami. Tatami mats are the traditional "flooring" made of rice straw. Tatami are in all rooms in traditional houses except for the kitchen. In modern homes tatami has been replaced by wood flooring, carpet and vinyl, although most detached houses built today have one or more traditional Japanese rooms with tatami (Fuyuki pers. com.). Wood flooring and tatami are found more often in detached houses, while the less expensive carpet and vinyl are used more frequently in collective housing (Yaguchi pers. com.). Due to health concerns, the use of carpet is decreasing and wood flooring is becoming increasingly popular in Japan (Cohen and Gaston 1998). Typical wood flooring systems consist of tongue-in-groove plywood overlaid with hardwood veneer rather than the tongue-in-groove hardwood strip flooring systems used in North America.

Wood Flooring - Classification

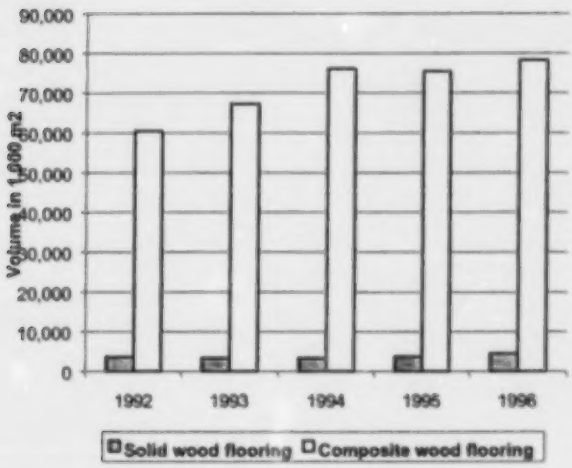
In the Japanese Agricultural Standards (JAS), wood flooring is classified into solid flooring and composite flooring (Mokuzai jukyû...1997). Solid flooring is divided into three categories: planks, blocks, and mosaic parquet. Flooring blocks are laminated flooring boards. Planks are the most common type of solid wood flooring. Most of the wood used are domestic species like the deciduous nara (*Quercus spp.*) and buna (*Fagus crenata*). They are harvested in northern Japan, mostly in Hokkaido. Some wood is also imported from North America, Europe, and China, but the imports are used as marginal supply and only make up for shortages in domestic supply.

There are three classes of composite flooring: plywood base, laminated base, and particleboard/fibreboard base. Plywood is used in 90 percent of the composite flooring, laminated core is used in less than 1 percent, and particleboard in 9 to 10 percent of the cases (Yaguchi pers. com.). Veneer is used on top of the base material, while paper overlay is not common.

Wood Flooring - Market

The market volume of solid and composite wood flooring in square metres is shown below. The volume of composite flooring is far higher than solid wood floors (accounting for almost 95 percent of all wood flooring), while solid wood floors capture only 5.5 percent of the wood floor market. Despite the market dominance of flooring made from veneer over plywood, the share of solid wood flooring has increased in the last 10 years (Mokuzai jukyû...1997). At least 80 percent of the solid wood flooring is used in public facilities, such as schools and commercial buildings, while most of the composite flooring is installed in residential housing (Yaguchi pers.com.).

Figure 11: Volume of solid and composite wood flooring market, 1992-1996



Source: Mokuzai jukyû to mokuzai kôgyô no genkyô (The Current Situation of the Wood Products Industry and the Supply and Demand of Wood Products)

Table 1: Volume of solid wood flooring market by type of floor and wood species, 1996

Solid wood flooring	Volume in 1,000 m^2	%
TOTAL	4,515	100.0
KILN-DRIED	4,353	96.4
Planks and block flooring	4,048	89.7
Buna (*Fagus crenata*)	478	10.6
Nara (*Quercus spp.*)	1,446	32.0
Other hardwoods	1,896	42.0
Imported woods	206	4.6
Mosaic parquet	306	6.8
AIR-DRIED	183	4.1
Domestic	0	0
Imported	183	4.1

Source: Mokuzai jukyû to mokuzai kôgyô no genkyô (The Current Situation of the Wood Products Industry and the Supply and Demand of Wood Products)

Table 2: Volume of composite wood flooring market by type of overlay, 1996

Composite flooring	Volume in 1,000 m^2	%
TOTAL	78,253	100
Veneered	77,592	99.2
Paper overlaid	661	0.8

Source: Mokuzai jukyû to mokuzai kôgyô no genkyô (The Current Situation of the Wood Products Industry and the Supply and Demand of Wood Products).

Solid wood flooring has become more popular in recent years. This may be due to increased concerns regarding formaldehyde emissions from composite flooring, increasing construction of two-by-four housing and increasing imported housing from North America. Westernised homes often use more imported building products such as hardwood strip flooring (Theisen and Dirks 1996). In connection with health-oriented housing, manufacturers of composite flooring started using F1 plywood as a base material instead of F2 to distinguish their products from others. F1 plywood having a lower level of formaldehyde emission than F2 (formaldehyde emission classes according to the JAS). Initiatives were taken by associations and the industry to increase the production of F1 plywood in Indonesia and Malaysia who deliver most of the plywood used in composite flooring ("JPMA and STA Hold Dialogue..." in Japan Lumber Journal 1998).

There is an increase in demand for a variety of composite flooring products. While the demand for flooring in general declined with lower housing starts, the demand for heated floor systems has increased. The heated floor system uses flooring panels that have either pre-installed electrical heating or hot water pipes below the flooring.. The majority of flooring systems are installed directly on concrete subfloors without floor joists. There is also an increase in soundproof flooring for both apartment housing and detached housing ("Supply/Demand of Laminated Wood Flooring..." in Japan Lumber Journal 1998).

Wood Flooring – Industry in Japan

The solid wood flooring industry consists of small factories in northern Japan, mostly in Hokkaido, that use local wood species. Only small volumes of wood are imported from overseas. In contrast, the manufacturers of composite flooring are very large flooring companies such as Daiken Kogyo and Matsushita whose a background in products that generally are not solid wood products. Composite flooring manufacturers import most of the raw material (plywood and veneer) from Southeast Asia. Demand and prices for composite flooring fell in 1998, reflecting the decrease in housing starts. Prices for the plywood used for producing composite products also fell, but less than for the finished product. Consolidations of composite flooring manufacturers are expected due to strong competition and a weak housing market ("Supply/Demand of Laminated Wood Flooring..." in Japan Lumber Journal 1998).

Japanese manufacturers are organized in the Solid Wood Flooring Industry Association and the Composite Wood Flooring Industry Association. These are practically one association with two member groups. The Solid Wood Flooring Association's member list of 1998 reports 87 members, with only 26 being producers and the remainder distributors. Nineteen large companies, which are listed in the appendix, were members of the Composite Wood Flooring Association in 1998.

Wood Flooring - Standards

Specifications, application and performance of wood flooring is described in the JAS. Although these standards are voluntary, many flooring manufacturers follow them. Of all of the flooring produced in Japan in 1994, 76 percent of the solid wood flooring was JAS-graded and 53 percent of the composite flooring was JAS-graded (Pesonen and Cohen 1996).

Composite Wood Flooring Products

This section summarises product information from interviews with house builders and from catalogues of Japanese composite flooring manufacturers.

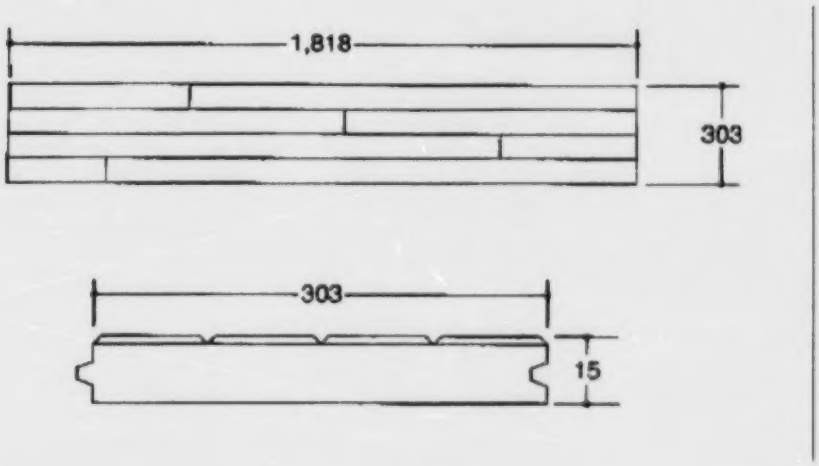
Structure and Sizes

Most of the composite flooring is made of pre-assembled, pre-finished panels that are fast and easy to install. About 90 percent of composite flooring have a base material made of tongue-and groove plywood. Thin veneers are laminated either directly on the plywood or on a middle layer of thin MDF. The finished flooring panel is relatively large (usually 303 x 1818 mm) or, if the pieces are small, they are pre-assembled into a larger panel. The most common flooring pattern is strip-like, but a variety of other patterns are also produced.

Most of the composite flooring is installed on floor joists. According to JAS, the size of a composite flooring panel for use on joists is about 30 cm wide, 180 cm long and 12 or 15 mm thick. Other sizes are possible according to JAS, but the above sizes are most common. For use on concrete, other specifications apply. The most common size of rectangular flooring panels on the market is 303 x 1818 and 12 to 15 mm thick. Other sizes include half the width (151.5mm) or double the length (3640mm) of the most common size given above. Herringbone pattern flooring is also pre-assembled in panels which are often 300 x 900 mm (Daiken and Tostem Catalogues).

Imported and domestic hardwood veneer is usually used for western-style or the traditional-western mixed style house interiors. Softwood veneer of native species, such as sugi (*Cryptomeria japonica*), hinoki (*Chamaecyparis obtusa*) and native pine species, is preferred for Japanese-style houses that represent only a small share of the market (Daiken Catalogue 1996-98 1996). The edge-grain softwood flooring has a very regular and homogeneous texture. The veneer may be impregnated for greater hardness and water repellence for kitchen and bathroom floors. The panels are often treated with wood preservatives, according to the JAS. The most common type of finish on composite wood flooring is polyurethane lacquer, which is applied to the panels prior to installation. Wax and oil finish is rarely used.

Figure 12: Typical ready-to-install composite flooring panel (sizes in mm)



Prices

The following table gives an overview of prices (for the end-user) for different qualities of hardwood and softwood composite flooring. The prices are end-user prices.

Table 3: Catalogue prices of composite flooring for detached houses, 1996-1998

	Veneer quality	Panel thickness	Price (¥/m²)	Price* (Cdn$/m²)
Western style (hardwood veneer)	natural (not hardened)	6 mm	3,640	46
		12 mm	4,550-6,370	57-80
		15 mm	5,730-9,880	72-124
	hardened	12 mm	8,220	103
		15 mm	9,610-18,310	120-229
	hardened and water-resistant (for kitchen, bathroom)	15 mm	14,880-16,290	186-204
Japanese style (softwood veneer)	hardened	12-15 mm	9,000-19,640	113-246
	extra hard (for entrance area)	15 mm	13,900-30,060	174-376

Source: Daiken Catalogue

(*Note: The conversion rate is 80 ¥/Cdn$)

Solid Wood Flooring Products

Solid wood floors in residential houses are typically imported (while wood floors from Japanese production are found more often in public and office buildings). The sizes of solid hardwood strip flooring sold in Japan by an US producer, for example, are 5/16" to ⅜" in thickness by 2 ¼" to 3 ¼" wide, random lengths. The average retail price without installation of this polyurethane-finished flooring in Japan is US$4.20/square foot, which is equivalent to Cdn$65/square metre (at 70 Cdn$/US$) (Arai pers. com.). This is relatively low when compared to the prices of composite flooring, but installation cost, which is not included in the prices given above, is higher for strip flooring than for composite flooring.

Survey Results for Flooring

Flooring in General

As Table 4 shows, about half of the respondents purchased flooring from 3 to 5 suppliers. One fourth had more than 10 suppliers.

Table 4: Source of supply of flooring

Source of supply	% of times selected
Make in house	7.7
1 to 2 suppliers	15.4
3 to 5 suppliers	53.9
6 to 10 suppliers	0
More than 10 suppliers	23.1

(Number of responses: 13)

The respondents were asked what type of flooring they install in houses. The most widely used material was composite flooring (thin solid wood or veneer on plywood base), followed by solid hardwood and carpet. Traditional tatami mats were usually found in one or two rooms of a modern house, with a share of 5 to 6 percent.

Table 5: Material used for flooring

Material	% of all installed flooring
Plywood base with thin solid wood/veneer	54.1
Solid hardwood	16.5
Carpet	9.6
Fibreboard core with non-wood laminate	7.7
Tatami	5.7
Vinyl	2.9
Solid softwood	1.9
Ceramic tiles	1.2
Fibreboard core with veneer laminate	0.4

(Number of responses: 13)

Table 6 shows the type of floor materials respondents installed based on the type of room. Non-wood flooring was preferred in the entrance, where the shoes are taken off before stepping up into the living area of the house. Halls, living rooms and dining areas can be grouped together with respect to the type of flooring. In a Japanese house, the living and dining areas are usually one room that is open to the kitchen. In these areas, as well as on stairways, wood flooring was highly preferred. The preferred location for solid wood flooring was mainly the hall, living rooms and dining rooms. In bedrooms, wood flooring was still preferred, but rather the less expensive composite flooring over solid wood. Non-wood flooring was generally selected for the bathroom, but many respondents also preferred wood flooring.

54 percent of the respondents who selected solid wood preferred hardwood. The other half did not prefer either hardwood or softwood.

The desired length of after-sales service for flooring ranged from 1 year to 5 years (average of 2 years).

Table 6: Floor materials preferred in different areas of the house

Material	% of times selected							
	Entrance	Hall	Living	Dining	Kitchen	Bathroom	Stairways	Bedroom
Plywood base with thin solid wood/veneer	6.7	50.0	47.1	50.0	41.2	25.0	42.9	50.0
Solid wood	6.7	25.0	29.4	31.3	17.7	10.0	42.9	11.1
Carpet	-	18.8	17.7	12.5	-	-	7.1	33.3
Fibreboard core with non-wood laminate	6.7	6.3	5.9	6.3	5.9	5.0	7.1	5.6
Tatami	-	-	-	-	-	-	-	-
Vinyl	13.3	-	-	-	23.5	35.0	-	-
Ceramic tiles	53.3	-	-	-	11.8	15.0	-	-
Fibreboard core with veneer laminate	-	-	-	-	-	-	-	-
Other	6.7	-	-	-	-	10.0	-	-

(Number of responses: 13)

Wood Flooring

In order to establish which type of wood floor is preferred, respondents were asked to rank the five types of wood floors listed in

Table 7. The scores were obtained by weighting the first choice with 5, the second choice with 4, etc. A higher score indicates higher preference.

The most preferred wood floors were solid hardwood and thin solid wood/veneer on plywood base. This corresponds well with the result that they were also the most often installed floors (Table 5). However, solid hardwood ranked higher in preference than actual use since prices were higher than for composite flooring. Solid softwood was ranked lower than wood on plywood base. The reason for this might be the properties of the material (softness), but it might also be related to the fact that solid softwood was rarely used (Table 5) and therefore not well known.

Table 7: Scores for preferred type of wood floor

Type of wood floor	Score
Solid hardwood	31
Plywood base with thin solid wood/veneer	25
Solid softwood	19
Fibreboard core with veneer laminate	11
Fibreboard core with non-wood (wood-imitating) laminate	7

(Number of responses: 7)

Table 8 shows the attributes preferred in wood flooring. There was no clear preference for either flat grain or edge grain. Most respondents said that it depends on the customer and on the design of the house. Light colour was preferred by most of the respondents. Sixty percent did not accept knots and the remainder indicated the presence of knots depends on the customers' taste and the design of the house.

Table 8: Preferred attributes for wood flooring

Attribute	% of times selected
Wood texture	
Flat grain	25.0
Edge grain	25.0
Depends	50.0
Colour	
Very light	5.3
Light	42.1
Medium	26.3
Dark	15.8
Very dark	0
Depends	10.5
Presence of knots	
Yes	0
No	58.3
Depends	41.7

(Number of responses: 12)

The common dimensions of wood flooring planks used by the respondents were the same as the dimensions of composite flooring and paper laminate flooring. Most respondents used plywood base flooring and the dimensions of the ready-to-install panels were approximately 300mm x 1800mm x 12mm. The dimensions are the same for paper laminate flooring. Three such panels roughly correspond to the size of one tatami mat. All respondents who used solid wood flooring imported it from North America or Europe. Plank width was varied with random lengths.

All respondents preferred a polyurethane finish. Finish on wood flooring should be clear, durable, easy to maintain, and not slippery. A non-slippery finish is important in Japanese houses because socks or

slippers without rubber soles are worn in the house. The appearance of wax finish was appreciated, but maintenance was seen as a problem.

Table 9 contains statements on attributes in wood flooring and their respective importance ratings. All three statements were considered to be very important to extremely important. In fact, these three attributes seem to be the most important attributes of wood floors apart from wood quality, which was the only attribute that the respondents added to the list.

Table 9: Importance of attributes in wood flooring

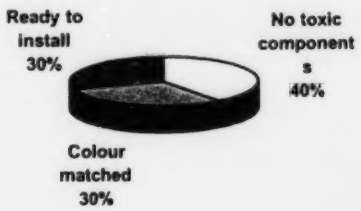
Attribute	Importance (5=extremely important, 4=very important, 3=important, 2=not very important, 1=not at all important)
The finishing contains no toxic components.	4.5
The wood is colour matched.	4.5
The flooring is ready to install.	4.2

(Number of responses: 12)

Respondents were also asked which characteristics of wood flooring they would pay a premium for and which they would expect to get a discount for. Results are shown in Figure 13 and

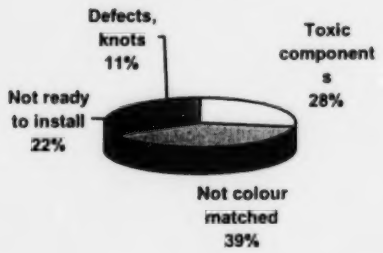
Figure 14.

Figure 13: Which characteristics of wood flooring would you pay a premium for?
(% of times selected)



(Number of responses: 10)

Figure 14: Which characteristics of wood flooring would you expect to get a discount for?
(% of times selected)



(Number of responses: 13)

The respondents mentioned the following aspects when asked about their greatest concerns regarding the quality of flooring. The concerns expressed are manifold, indicating that quality problems vary depending on floor type and supplier.

Table 10: Concerns in quality of flooring

Appearance, colour matching
Containing toxic components
Durability
Ease of installation
Instructions for installation and maintenance
Maintenance
Price
Quality of drying (warping, shrinking, cracks)
Soundproofing, squeaking
Surface smoothness
Width and thickness tolerance
Wood quality (straight grain)

Window Market

Overview on the Window Market

The total market for windows in residential housing was estimated at ¥438.8 billion (5.5 billion Cdn$ at 80 ¥/Cdn$) in 1996 (Takabatake 1997). Aluminium dominates the market in Japan, accounting for over 90 percent of all windows, a unique feature in Japanese house construction when compared to other industrialised countries. The current market for wood windows is mainly a niche market because of the fire regulations that generally preclude the use of wood windows in fire zones and quasi-fire zones. Before 1960, when locally produced wood windows were still common, wood windows were made using complex joinery systems. Many were factory-manufactured and had problems with shrinking, water tightness, and air tightness. Quality problems also came from the fact that in traditional post-and-beam houses, carpenters made the sash but not the window itself often resulting in a poor fit. When aluminium windows were introduced in the 1960s, the market shifted from the poor-quality wood windows to aluminium windows. The production of aluminium sash increased dramatically to dominate the market today (NKS Information Network 1994).

Vinyl windows had an estimated share of 8 percent of the total window market in 1996 (Takabatake 1997). Most of these (90 percent) are produced in Japan and installed in Hokkaido, where cold winters make good insulation necessary and where the low population density does not require windows to comply with fire regulations. Ninety-five percent of residential windows in Hokkaido are vinyl windows (Takabatake 1997). Most imported vinyl windows are installed in imported houses and two-by-four houses throughout Japan as a low cost alternative to wood windows.

In order to keep the high market share of aluminium windows, Japanese aluminium window manufacturers have started to produce windows with better insulating properties (Takabatake 1997).

Wood Windows - Market

The market for wood windows was estimated at 10.8 billion Yen (135 million Cdn$ at 80 yen/Cdn$) in 1996 (Takabatake 1997). Reliable statistical information exists only for imported windows, not on domestic production, because it is only recently that Japanese companies have started to manufacture a significant volume of wood windows. Western-type windows accounted for about 4 billion Yen (50 million Cdn$) in 1993 (NKS Information Network 1994). A large portion of the total wood window market is accounted for by the shoji, a sliding screen on the inside of the Japanese style sliding window.

Unlike vinyl windows, most wood windows are imported and installed primarily in western-style houses (both Japanese-built and imported) and in second houses in mountain resort areas (Takabatake 1997). They are more expensive than the usual aluminium windows but have high insulation values and more individualised designs. As a result, there is a strong relationship between the number of western-style houses built and the market for wood windows. Since the share of western-style houses (imported and produced in Japan) is expected to increase, the wood window market is also estimated to grow (Takabatake 1997). In response to the large volume of imported windows, Japanese manufacturers recently started producing western-style windows. However, aluminium windows

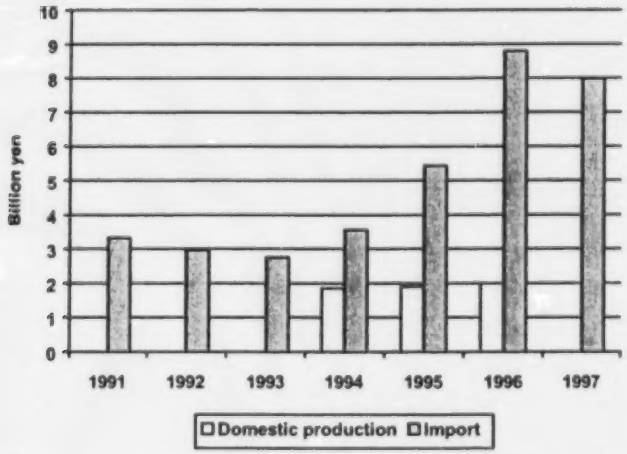
dominate in traditional post-and-beam housing, which still has the highest share of the residential detached housing market. Part of the reason is the strict fire regulations in urban areas that favour the use of aluminium windows.

As with vinyl windows, a large market for wood windows exists in Hokkaido and in north-east Japan, where winters are very cold and fire regulations do not prohibit the use of wood windows. Increased construction of energy-saving housing could increase the market for wood windows. The government is encouraging house buyers to build houses that have a lower energy consumption through the GHLC which offers preferential financing for houses using energy-saving building materials such as energy-saving windows (Japanese Government Housing Loan Corporation Building Manuals 1998). Furthermore, wood windows fit the present trend in Japan towards environmentally safe and healthy housing better than aluminium (NKS Information Network 1994). A report published by the Foreign Agricultural Service attributes the recent surge in wood window exports partly to new opportunities for multi-storey wood-frame construction resulting from the 1990 US-Japan Wood Products agreement (Theisen and Dirks 1996).

The following factors speak to increasing wood window consumption in Japan:

1) the popularity of houses in western design, high class houses, log homes and second houses;
2) the promotion by the government of energy-saving housing;
3) the more individual style of wood windows compared with the uniform appearance of aluminium windows; and
4) increasing construction of houses in rural areas where the fire regulations do not apply.

Figure 15: Import and estimated domestic production of wood windows, 1991-1997



Source: Japan Tariff Association (import), Commercial Service Osaka-Kobe (domestic production)
Note: Domestic production figures are estimates and were only available for 1994-1996).

Wood Windows – Industry in Japan

Only an estimated 19 percent of the total wood window market was from domestically produced in 1996 (Takabatake 1997), equivalent to less than 1 percent of the total residential window market. Most manufacturers of wood windows in Japan are medium or small sized companies in contrast to the very large aluminium sash manufacturers. Due to their limited production capacity, none of the companies producing wood-only windows are present throughout Japan (Krause 1993). Much of the production is done on a customized basis. Many of the windows manufactured in Japan are made of imported timber and use expensive European tilt-and-turn hardware. Because of these high costs, the producers concentrate on the upper-end market. If wood windows develop from a niche market of imported windows to a widely accepted product, manufacturers in Japan may improve technology and price competitiveness, and increase domestic production (NKS Information Network 1994).

The Japan Housing and Wood Technology Center (HOWTEC) has recently formed a wood window association as glass manufacturers integrated into wood window and sash manufacturing. The Wood Window Association has 15 members (listed in the appendix) that are major manufacturers of wood windows in Japan. The remainder of the 30 association members are suppliers and importers.

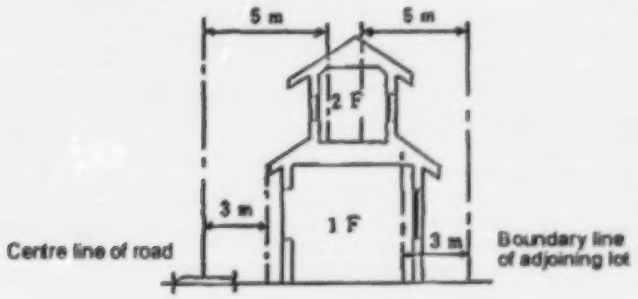
Wood Windows - Regulations and Standards

Fire Regulations

The most important regulations for windows are the fire regulations in the Building Standard Law of the Ministry of Construction (Takabatake 1997). Japan has strict fire regulations because of the dense urban population and frequent earthquakes and typhoons. The fire regulations have promoted the use of non-wood materials for windows, especially aluminium. The fire regulations apply to house construction in fire zones and quasi-fire zones. In these zones, the aim of the fire regulations is to keep the fire from spreading to other buildings. Although only 19 percent of Japan is zoned as fire or quasi-fire zone, most urban areas, where most new home construction occurs, are fire or quasi-fire. Windows need not comply with the fire regulations in these zones if they meet one of the following criteria: 1) they are installed in the first floor more than 3 metres away from the adjacent lot line or centre line of the road, or 2) if they are installed in the second floor or higher more than 5 metres away from the adjacent lot line or centre line of the road. However, most houses in fire or quasi-fire zones have their second-floor windows within 5 metres of the lot line or centre of the road, so most windows used in urban areas have to comply with fire regulations (Takabatake 1997).

The fire regulations do not distinguish between doors and windows because traditional Japanese house had full-length shoji (wood and paper sliding doors) functioning as both doors and windows. The term "fire door" in the regulations refers to all openings including windows. Articles 64, 109 and 110 of the Building Standard Law specify exactly when fire doors have to be used as well as their characteristics (Takabatake 1997). There are two classes of fire doors: class A fire doors have a 60 minute fire rating and are required only in larger multi-family buildings in fire zones; class B fire doors with a 20 minute rating are for detached houses in fire zones/quasi-fire zones and multi-unit buildings in quasi-fire zones.). Table 11 shows the number of window products approved as class B fire door in 1994 by sash material.

Figure 16: Distances within which house openings require fire doors/windows in fire and quasi-fire zones



To gain approval as a fire door, aluminium windows are not subject to the individual testing that is required for wood windows or plastic windows (Takabatake 1997). The Ministry of Construction has given the responsibility of enforcing fire regulations for aluminium windows and doors to the Aluminium Fire Door Association which has about 70 members, six of whom are very large producers of aluminium sash (Tokunaga pers. com.). The association certifies aluminium windows of its members under a group approval system such that the windows do not have to be tested individually for the class B fire door rating. Some of the association's members also produce aluminium-clad wood windows and are attempting to have the group approval system apply to this type of window as well. US exporters have also tried to get a similar system of group approval for wood windows imported from the US (Takabatake 1997). Presently, wood windows and wood combination windows have to be tested individually, which is both time consuming and costly. Without approval as fire doors, wood windows are mostly restricted to houses outside fire zones and quasi-fire zones; that is in rural areas where there has been little population growth or new house construction until recently. In 1993, the trend in population shifting from rural to urban areas reversed for the first time since the Second World War (Fuji Research Institute Corporation 1997). Consequently, the proportion of house construction in fire and quasi-fire zones (in urban areas) is declining while more new houses are being built in rural areas where fire regulations do not apply.

Table 11: Number of windows approved as class B fire door, 1994

Window material	Number of approved windows
Wood	16
Wood combination	2
Aluminium	25
Steel	2
Plastic	2
Other	1

Source: Wood Window Handbook

Standards

In order to improve the quality of wood windows, HOWTEC has developed new performance standards that are currently under review. The standards focus on water tightness, air tightness, and strength against wind pressure (Soya pers. com.).

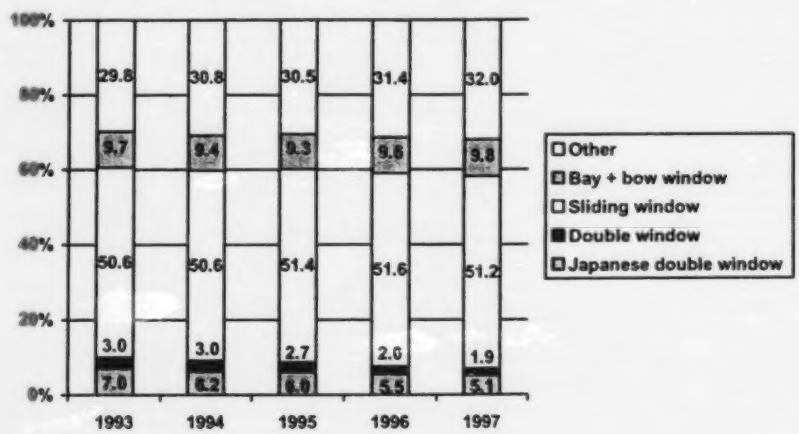
Window Attributes

Stress on windows in Japan is higher than in most temperate countries. Summers are hot and humid while winters are cold and relatively dry. In autumn, strong winds combine with heavy rains. Therefore, water infiltration and dimensional stability are some of the more important issues in window construction in Japan compared to North America.

Originating from the shoji (wood and paper sliding doors) in traditional Japanese houses, double-sliding windows are the most common window type used today. The double-sliding window, in which both window panes can slide, is not commonly produced in North America or Europe. Almost all sliding windows in Japan are made of aluminium.

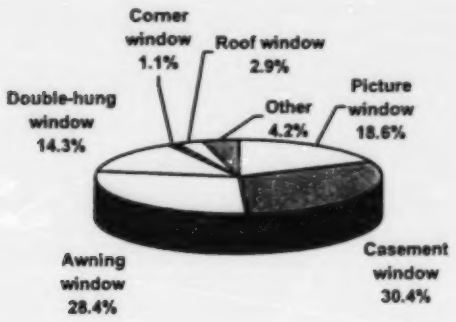
Figure 17 shows the types of windows used in detached housing. The data is based on a sample of 4010 newly built detached houses surveyed by the Japan Sash Association throughout Japan every year (Japan Sash Association 1998). About 60 percent of all windows were sliding windows. Other windows (western-type windows) increased slightly to 32 percent. Casement and awning windows were the most often installed western-type windows (Figure 18). These windows were used predominantly in western-style houses including two-by-four and imported housing. The relatively expensive bay and bow windows also remained popular.

Figure 17: Window types in detached housing, 1993-1997



Source: Survey by Japan Sash Association

Figure 18: Percentages of other window types in detached housing, 1997

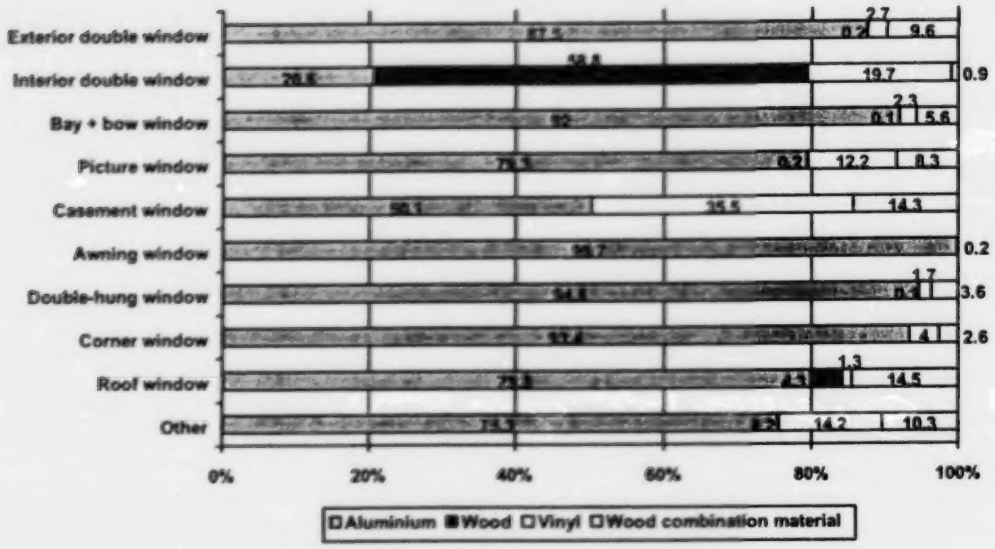


Source: Survey by Japan Sash Association

Figure 19 gives a breakdown of the material used for sash and frame by window type. Aluminium is the dominant material for all window types, with the exception of casement windows and the inner sliding frame of the double window. About half of the casement windows surveyed are made of vinyl or wood combined with aluminium or vinyl. The popular standard sliding window is not shown in this figure, but the proportion of aluminium is almost 100 percent for this window type (Japan Sash Association 1998).

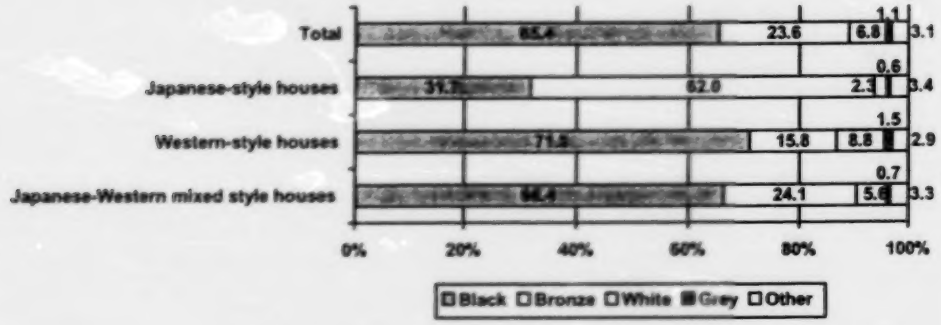
The colour of windows is mainly dark (Figure 20). Japanese-style houses have mostly bronze sashes, while western-style house owners prefer black. Aluminium windows in bronze are closest to the colour of the traditional unfinished wood windows and doors. White windows are more common in western-style than in Japanese traditional housing.

Figure 19: Sash material by window type, 1997



Source: Survey by Japan Sash Association

Figure 20: Colours of window sash by style of house, 1997



Source: Survey by Japan Sash Association

Survey Results for Windows

Windows in General

The number of suppliers (shown in Table 13) from which the companies purchase windows indicates how difficult it is for a new supplier to enter the market. Most companies (over 80 percent) purchased from only 3 to 5 suppliers.

Table 12: Source of supply of windows

Source of supply	Windows (% of times selected)
Make in house	7.7
1 to 2 suppliers	23.1
3 to 5 suppliers	53.9
6 to 10 suppliers	7.7
More than 10 suppliers	7.7

(Number of responses: 12)

Table 13 shows the primary materials used by respondents in windows. At almost 80 percent, aluminium was the most important material. The proportion of wood windows was very small, but if aluminium-clad and vinyl-clad wood windows are included then the total share for wood windows was 13.1 percent. Vinyl windows had only a small share.

Table 13: Material used for windows

Material	% of all installed windows
Aluminium	79.8
Aluminium-clad wood	7.4
Vinyl	5.5
Vinyl-clad wood	4.1
Wood	1.6

(Number of responses: 11)

The desired length of after-sales service for windows ranged from 2 years to the entire life span of a house, which is normally 20-30 years. Leaving out the two respondents who answered 30 years, the average desired length was 3 to 4 years.

All companies interviewed used at least some fire-rated windows. For most companies, the Tokyo area (Kanto) was the most important market. All of this region is a fire protection or quasi-fire protection zone which means that all houses that fall short of certain distances from neighbouring houses must have fire-rated doors and windows. Tokyo City is densely populated and lot sizes are small which means that virtually all houses require fire-rated doors and windows. In the adjacent prefectures, the density is less and not all houses have fire-rated doors and windows. The average percentage of houses built by the respondents that require fire-rated doors and windows was 51 percent. The strictest fire

rating, type A, was required for 16 percent of the houses. Type A fire rating is only required in apartment buildings, not in detached single homes.

The respondents also rated the importance of several product attributes with respect to windows. The importance of these attributes is shown in Table 14. All attributes were considered as important to extremely important. The only attribute with a lower rating was "the availability of many different sizes". "Containing no toxic components" had the highest rating among all attributes. This shows the importance health issues in housing. "A high insulation value" was also rated relatively highly, which may have to do with Japan's expected reduction in carbon dioxide emissions and the decrease in the use of heating fuel. Fire rating is not among the most important attributes.

Table 14: Importance of attributes in windows

Attribute	Importance (5=extremely important, 4=very important, 3=important, 2=not very important, 1=not at all important)
The finishing contains no toxic components.	4.5
They have a high insulation value.	4.4
Material and design match the interior design of the house.	4.1
Delivery is speedy and dependable.	4.1
They are soundproof.	4.3
They are approved for use in fire and quasi-fire protection districts.	4.1
There are a wide variety of designs available.	3.9
There are many different sizes available.	3.2

(Number of responses: 11)

The types of windows installed by the companies interviewed are listed in

Table 15. The respondents were asked if they expect the percentages of the window type that they presently use to increase, decrease, or remain the same. Nearly half of the windows installed were traditional double-sliding windows. These were followed by casement, double-hung, and picture windows, all with similar percentages. These three window types were expected to remain the same or to increase, whereas the proportion of double-sliding windows was expected to remain the same or to decrease. So, overall the double-sliding window is probably expected to decrease slightly in favour of casement and double-hung windows.

Table 15: Window types used by respondents

Window type	% of all windows used	Expected to increase	Expected to decrease	Expected to remain the same
		% of times selected		
Double-sliding window	44.4	8.3	33.3	58.3
Casement window	17.0	37.5	0	62.5
Double-hung window	15.6	25.0	0	75.0
Picture window	11.7	33.3	0	66.7
Bay window	10.2	30.0	10.0	60.0
Awning window	1.0	-	-	-

(Number of responses: 11)

Regarding quality of windows in general, the respondents had the following concerns: water infiltration, air-tightness, insulation, durability, functioning of moving parts, and soundproofing. Water infiltration was mentioned most often. Since both typhoons and high winds carrying water vapour occur commonly in all parts of Japan, windows have to fulfil higher requirements for water infiltration in Japan than in North America.

Wood Windows

Since all respondents used aluminium windows mainly, they were first asked whether they would consider using or do use wood windows. Sixty seven percent of the respondents would consider using wood windows, which is about equal to the percentage of companies currently installing wood windows, while only 25 percent would not consider using wood for windows and the remaining 8 percent did not know. The reasons for not using wood windows included the following: higher prices, maintenance requirements, shorter durability, and fire rating of windows.

Table 8 summarises the attribute preferences of the respondents for wood windows. A clear result is that the finish should leave the wood texture visible on the inside of the house. Windows were generally preferred to be a light colour on the inside of the house. There was no clear preference for colour on the exterior of windows, although dark colours were selected more often than other colours. Respondents preferred to have windows pre-finished and without knots. This was especially important on the inside of the house where the wood texture is visible. As long as knots are not visible (e.g. under paint, aluminium cladding) the products were acceptable.

Table 16: Preferred attributes for wood windows

Attribute	Windows %. of times selected
Wood texture visible on the inside of house	
Yes	100
No	0
Depends	0
Colour on the inside	
Very light	9.1
Light	54.6
Medium	9.1
Dark	18.2
Very dark	0
Depends	9.1
Colour on the outside	
Very light	15.4
Light	15.4
Medium	15.4
Dark	38.5
Very dark	0
Depends	15.4
Pre-finished or unfinished	
Pre-finished	66.7
Unfinished	33.3
Presence of knots	
Yes	0
No	88.9
Depends	11.1
Hardwood or softwood	
Hardwood	33.3
Softwood	44.4
Doesn't matter	22.2

(Number of responses: 9)

There was no clear preference for softwood or hardwoods. For windows, the following softwoods were selected: Douglas-fir, fir, hemlock, pine, spruce, yellow cedar; and for hardwoods: ash, cherry, elm, maple, oak. Some of the wood species mentioned for windows suggest that the respondents had limited experience with wood windows and selected the species only based on design aspects.

The respondents were further asked whether or not they would use windows with finger-jointed or laminated components (Table 17). Their main concern was the visibility of glue lines and the toxicity of the glue. More than half of the respondents did not want finger-jointed components, while one third would not use laminated components. If the toxicity concern can be eliminated, the acceptance of laminated components in windows could be higher.

The respondents clearly preferred aluminium-clad wood windows over wood-only and vinyl-clad wood windows.

Table 17: Additional attributes for wood windows

Attribute	% of times selected
Finger-jointed components	
Yes	0
No	55.6
Depends	44.4
Laminated components	
Yes	44.4
No	33.3
Depends	22.2
Wood-only or combination material	
Wood-only	22.2
Aluminium-clad wood	66.7
Vinyl-clad wood	11.1

(Number of responses: 9)

Survey Results for Quality Certification

Interior Finish Products and Quality Certification

To determine the most important areas in a house in which to use finished wood products, respondents were asked to rank the three most preferred interior finish items to be made of wood. The following table shows the scores for the items selected. Scores were calculated by assigning 3 to rank 1, 2 to rank 2, and 1 to rank 3. Flooring was the highest ranked item, followed closely by moulding and interior doors. Windows and exterior doors were also ranked relatively highly.

Flooring was also ranked highest by all respondent groups (consumers, designers, builders) followed by stairways and doors in the survey by Cohen and Gaston (1998). The main difference seen in this study was a much lower ranking of windows. Since the respondents in this study knew that the interview was focussed on wood windows and flooring, they may have been biased in answering this question.

Table 18: Scores for preferred interior finish products made of wood

Interior finish products	Score
Flooring	17
Moulding	15
Interior doors	13
Exterior doors	10
Windows	9
Kitchen cabinets	4
Stairways	3
Cabinet doors	1
Wainscoting	1

(Number of responses: 12)

The majority of respondents were interested in buying wood products that are certified by a quality assurance program (

Figure 21). The respondents who would like to see a quality assurance program were asked to list the wood products that they prefer to have certified (Table 19). Exterior doors, interior doors, and windows were most often selected to be quality certified. Other products are of much less interest with respect to quality certification.

Figure 21: Would you like the wood interior finish products that your company purchases certified by a quality assurance program?

(Number of responses: 13)

Table 19: Wood interior finish products that should be certified by a quality assurance program

Wood interior finish product	% of times selected
Exterior doors	21.7
Interior doors	21.7
Windows	21.7
All products	8.7
Flooring	8.7
Moulding	8.7
Ceiling	4.4
Wainscoting	4.4

(Number of responses: 12)

When asked whether they would prefer a process quality certification program, a product quality certification program, or a program certifying both, no one chose process quality certification. A process quality certification certifies the production process while product quality certification involves testing the finished product for its intended use. Of the respondents who preferred a program certifying both process and product, 80 percent found quality in the product more important than quality in the process. Combining these two results, product quality was more important than process quality in a certification program for 90 percent of the respondents.

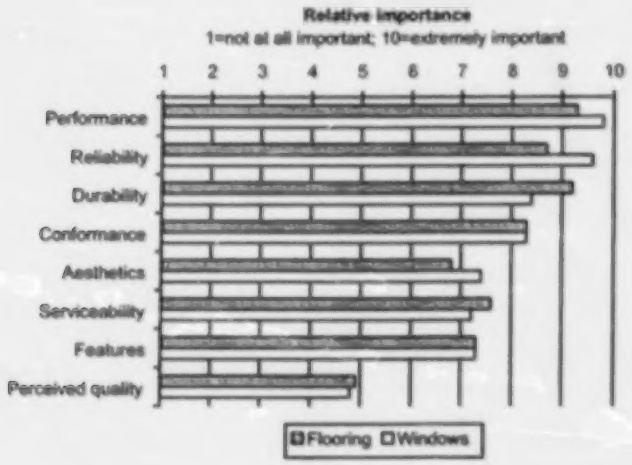
When respondents were asked what they expect from products certified by a quality assurance program, less than half (44 percent) expected that the products would fulfil certain quality standards and continuous quality. The other half (56 percent) expect a good after-sales service and a quick response to claims.

Quality in Flooring and Windows

Respondents were asked to identify the relative importance of several factors in determining the quality of flooring and windows. The eight dimensions of quality described by Garvin were used as factors given their theoretical and empirical veracity (Garvin 1984). Results are shown in Figure 22.

Reliability, performance, and durability were the most important quality factors for all three products. Performance and reliability were more important in windows than in flooring, while durability was more important in flooring. Product features and serviceability (maintenance requirements) were rated relatively low, but not as low as perceived quality. It is surprising that for flooring, aesthetics was rated lower than all other factors except perceived quality.

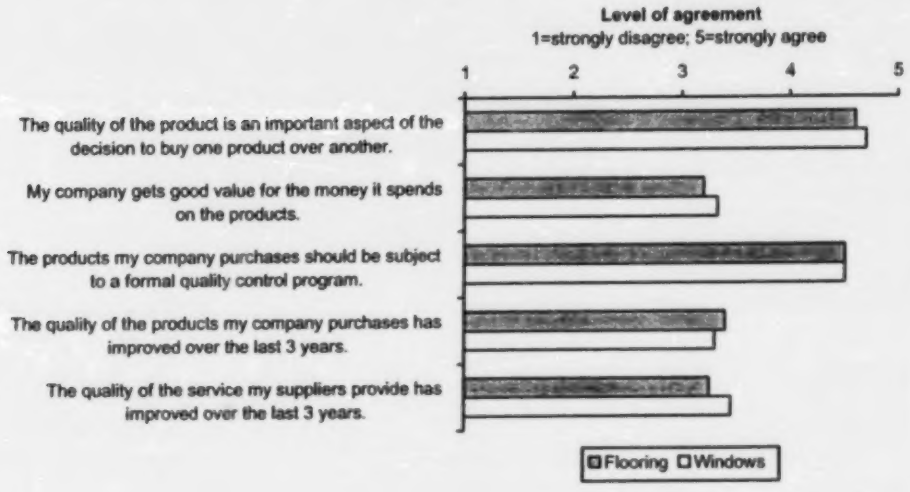
Figure 22: Relative importance of quality factors in flooring and windows



(Number of responses: 8-12)

Figure 23 illustrates the level of agreement for five statements on quality of purchased products. The respondents' answers were neutral with respect to recent improvements in product and service quality provided as well as value for money spent, while the importance of product quality and formal quality control was emphasized. There are no large differences in the responses for flooring and windows.

Figure 23: Level of agreement with statements on quality of windows and flooring


Level of agreement
1=strongly disagree; 5=strongly agree
1
2
3
4
5
The quality of the product is an important aspect of the decision to buy one product over another.
My company gets good value for the money it spends on the products.
The products my company purchases should be subject to a formal quality control program.
The quality of the products my company purchases has improved over the last 3 years.
The quality of the service my suppliers provide has improved over the last 3 years.
Flooring
Windows

(Number of responses: 10)

Discussion and Conclusions

Flooring

The Japanese wood flooring market is very large, with wood flooring being the most popular material in Japanese residential housing. Both this study and the previous survey by Cohen and Gaston[4] indicated that its share among the total residential flooring market is expected to increase. The main flooring product is composite flooring which is mostly plywood imported from Southeast Asia overlaid with hardwood veneer. Softwood veneer and paper have only a small share. The survey showed that house builders do prefer solid wood flooring, but because of the lower price, they generally purchase composite flooring. Nevertheless, the share of solid wood flooring has grown in the last years to about 5.5 percent. This increase reflects growth in western-style two-by-four houses, imported houses, health concerns over formaldehyde emissions and the revival of wood in interior finish.

Large Japanese manufacturers dominate the market for composite flooring and competition among them for price driven market share is severe. Solid flooring is produced by small local manufacturers. Entering the solid wood flooring market is therefore easier than the composite flooring market . The number of flooring suppliers to house builders was relatively high which could facilitate market entry for new suppliers.

The common perception is that the Japanese prefer homogeneous wood texture and colours in interior finish products. This survey showed that there is a wide range in preferred textures and colours and that the customers' preferences are becoming more diversified.

For solid flooring, market entrance should be easier since Japanese competition is much less concentrated compared to composite flooring where companies are adapting to decreased housing starts by dropping prices to maintain sales volume.

- As the survey showed, for both solid and composite flooring the best opportunities exist for light, colour-matched floors with a polyurethane finish. Knots are only desired by some customers.

- It is essential that the flooring is ready-to-install; i.e. pre-finished and pre-assembled to panels. This poses no problem for composite flooring, but pre-assembled or easy to assemble solid wood flooring products have to be developed.

- In the growing solid wood flooring market, moderately priced softwood flooring may have good possibilities. Because softwood is generally not regarded as being hard enough, it should be hardened or at least have a very hard finishing.

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[4] Cohen, David H., and Christopher Gaston. Japan's Value Added Market: Wood Products Attributes and Competition. Forintek Canada Corp., prepared for Forest Renewal BC, 1998.

- The medium to low-priced flooring market is a good target for paper laminate flooring since laminate flooring has not entered the market on a large scale. Greater hardness and good appearance could overcome consumers' preferences for veneered surfaces.

High-quality paper laminate flooring could also be a successful product for the non-residential flooring market, which this study did not examine.

The Japanese market for wood flooring is very large and competition from Japanese manufacturers is intense. Solid flooring appears to be the best opportunity, but additional information has to be gathered on competition outside of Japan and production possibilities in British Columbia. In the past, flooring has not been a major product in BC since eastern hardwood species are in some properties (e.g. hardness) better suited for solid strip flooring than the BC softwoods and hardwoods. With technologies for hardening wood being available, it is now possible to produce both solid and veneered flooring from under-utilised hardwood species in BC, such as white birch (*Betula papyrifera*) or bigleaf maple (*Acer macrophyllum*), and softwood species such as hemlock (*Tsuga heterophylla, Tsuga mertensiana*) that is available in relatively large volumes and has good processing and finishing properties.

Windows

The wood window market has only a very small share (< 2 percent) of the total residential window market, but this share has increased over the last 10 years. Most of the wood windows are imported and of western design. The small Japanese production is generally high priced relative to the product quality. Several current trends are favourable for the growing wood window market in Japan. It is expected to increase with the growth in western-style houses in Japan. Japanese consumers have come to prefer wood as interior finish material again for appearance and designs. Finally, the Government Housing Loan Corporation (GHLC) is promoting energy-saving houses that specifies wood, vinyl and insulated aluminium windows in the cooler regions of Japan (central and north-east Japan, Hokkaido) instead of the now-dominant standard aluminium windows.

Vinyl windows are seen as low-cost alternatives to wood windows with equally good insulating properties. Aluminium sash manufacturers have started producing insulatting aluminium windows with soft vinyl separating the inner and outer frame of the window. As far as heat insulation is concerned, wood windows compete with both vinyl and aluminium materials. If wood windows are to be accepted on a larger scale in the market, they have to overcome the image of poor quality products which was created mainly by low-quality past Japanese production. Maintenance is always regarded as a disadvantage to wood windows compared to aluminium and vinyl windows. Most companies interviewed, therefore, prefer aluminium-clad wood windows.

Competition from Japanese wood window producers is not high since they have just started significant production and the quality of their windows is relatively low. When wood windows gain popularity in Japan, local producers will probably improve quality and cost competitiveness. A more serious source of competition comes from some of the large aluminium window manufacturers who have started producing aluminium-clad wood windows.

Obstacles for selling wood windows on the Japanese market revolve around the present procedures of getting wood windows approved as fire-rated windows for the use in fire zones and quasi-fire zones in

urban areas. Aluminium windows have an advantage in that they can obtain group approval without individually testing each window product. However, there are also opportunities for non-fire rated wood windows since fifty percent of the windows installed by the companies surveyed are non-fire rated windows (although all companies operate primarily in the densely populated Tokyo region). Fire-rating was also ranked lower by respondents in terms of attribute preference than the following – non-toxic components, heat insulation, sound insulation. These attributes had the highest ratings which indicates a competitive advantage for wood windows when compared to vinyl or aluminium.

A group approval system for fire-rated wood windows and wood-combination windows has to be promoted to overcome this disadvantage versus aluminium windows. Members of the Japan Fire Door Association and the Wood Window Association as well as US exporters, have been working towards an easier approval of wood windows. The Japan Fire Door Association plays an important role since it now carries out the group approvals for the aluminium window manufacturers.

The companies surveyed indicated the following preferences for attributes in wood windows: pre-finished, dark colour on the exterior, light colour with visible wood texture on the inside. From the design perspective, the superiority of wood windows lies in its wood texture; all respondents stressed that it should be visible on the inside frame. This means that windows made of high quality solid wood components without knots or other visible marks have the best market possibilities.

Based on the survey results, the number of suppliers to house builders is large enough to allow new suppliers to enter the market. Wood window producers shou'd target specific markets since the product is not generally accepted and long-term market share is only possible with clear goals and a knowledge of the customer. Based on the information gathered in this study, there are several opportunities for wood window producers to enter the window market or increase market share.

- There are opportunities for aluminium-clad windows in the high-end market for design-, health- and environmentally conscious house buyers.

- Taking advantage of the present promotion of energy-saving housing, wood windows at affordable prices with heat insulation (according to the GHLC specifications) have better chances than in the past, especially with the increasing westernization of Japanese homes.

- The typical Japanese double-sliding window is still the single most widely installed window today and is available on the market only in aluminium. Although some respondents expect a decrease in double-sliding windows and an increase in western-type windows (casement, double-hung windows), most companies do not expect significant changes. To obtain a significant share of the window market, wood window producers should develop double-sliding windows in wood or wood combined with aluminium.

In order to gain acceptance of wood windows in general producers must be careful to deliver good quality products consistently and to consider quality issues specific to Japan such as water infiltration.

Although wood windows have only a small share of the total window market, it would be worthwhile to examine this market further because: 1) the wood window market is growing, 2) competition from the Japanese industry is relatively low, and 3) wood species in British Columbia are very well suited for producing windows. In order to judge opportunities for window manufacturers in British Columbia,

more information on competition for the Japanese wood window market and distribution systems for imported windows is needed. British Columbia has excellent resources to produce light-coloured, clear windows required by the Japanese market (e.g. Douglas-fir, hemlock and spruce). Current and possible future production of wood windows in BC needs to be assessed.

Quality Certification

The building product listing through the GHLC, which provides low interest financing for houses using materials and products approved by HOWTEC or Better Living, makes it difficult to have an additional quality certification accepted in the market place. Since the GHLC finances a very large portion (about 35 percent) of the residential market, with a much higher share for homer-owned detached houses, small house builders indicated that they almost only buy products from the GHLC list. Large builders, however, follow their own standards, and with increasing imports of finished building products into Japan, more builders will purchase products that are not on the GHLC list. The survey showed that most house builders would like to buy quality-certified interior finish products. Both a minimum and continuous product quality, as well as good after-sales service, is expected from quality-certified products.

Quality certification is desired more for windows and doors than for flooring. Satisfaction with product quality is lower for windows than for flooring. Imported windows from North America were criticised by the respondents with respect to problems with hardware and water infiltration. A Canadian quality certification for product quality as it is being developed for the wood products industry would be an effective marketing tool for windows. For flooring, quality certification would probably not be as effective, but serve to increase consumer confidence in new products. For full market access, however, products should be on the GHLC list which means co-operation with current Japanese suppliers and their associations.

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Soya, Takashi	Director, Japan Wood Window Association, Tokyo, Japan.
Tokunaga, Yukio	Executive General, Japan Fire Window Association, Tokyo, Japan.
Yaguchi	Director, Japan Solid Wood Flooring Industry Association, Japan Composite Flooring Industry Association, Tokyo, Japan.

Abbreviations and Glossary

JAS	Japanese Agricultural Standards
JIS	Japanese Industrial Standards
GHLC	Government Housing Loan Corporation
HOWTEC	Japan Housing and Wood Technology Center

Awning windows	Windows that have one or more sash that are hinged at the top and swing out at the bottom.
Bow windows	Bay windows that are curved in plan instead of angular.
Double-hung windows	Windows consisting of two sash that slide up and down in the window frame.
Double-sliding windows	Windows with two or more sash that slide horizontally. When three sash are used, the centre one is usually fixed.
Kômuten	Japanese carpenters and house builders who construct less than 100 houses per year.
Tatami	Straw mat floor in traditional Japanese rooms.

Appendices

A. Members of Japan Composite Wood Flooring Association

East Japan	
AP FLOOR	1-1-5 Mukôhama, Akita-shi, Akita 010-16 Tel: 0188-24-0801
PAL	HK-Shinjyuku Building, 4-3-17 Shinjuku, Shinjuku-ku, Tokyo 160-0022 Tel: 03-3226-8001
NODA	5-13-6 Asakusabashi, Taitô-ku, Tokyo 111-0053 Tel: 03-5687-6511
Shin-Nikkô-kagaku	The 2nd Shin-nittetu Building, Higashi-kan, 2-31-1 Shinkawa, Chûo-ku, Tokyo 104-0033 Tel: 03-5541-3611
Central Japan	
IKUTA	117 Bougane-machi, Seto-shi, Aichi 489 Tel: 0561-85-2461
Tôyô PLYWOOD	1-2-30 Sannou, Nakagawa-ku, Nagoya-shi, Aichi 454-0011 Tel: 052-323-1711
YUASA Kenzai-kôgyô	1-94 Kiba, Tobishima-mura, Kaifu-gun, Aichi 490-1444 (Nagoya Factory) Tel: 05675-5-1521
Kansai (Osaka and Kyoto)	
Asahi WOODTECH	4-5-10 Minami-hon-mchi, Chûo-ku, Osaka-shi, Osaka 541-0054 Tel: 06-245-8525
Eidai Sangyô	2-10-60 Hirabayashi-minami, Suminoe-ku, Osaka-shi, Osaka 559-0025 Tel: 06-675-2341
TOSTEM WOODWORK	2-12-16 Hirabayashi-minami, Suminoe-ku, Osaka-shi, Osaka 559-0025 Tel: 06-683-8221
Matsushita denkô (Matsushita Electronics)	1048 Ôaza-Monma, Monma-shi, Osaka 571-0050 Tel: 06-909-6088
Uematu Shôji	13-2 Zaimoku-chô, Kishiwada-shi, Osaka Tel: 0724-37-5111
Daiken Kôgyô	Shin-asahi Building, 2-3-18 Nakanoshima, Kita-ku, Osaka-shi, Osaka 530-0005 Tel: 06-228-3396
Marudama Sangyô (Maizuru factory)	1157 Aza Taira, Maizuru-shi, Kyoto-fu 625-0133 Tel: 0773-68-0201
West Japan	
SETOUCHI Kakô	3012 kori, Okayama-shi, Okamaya-ken 702-8011 Tel: 0862-67-2101
Jyûken Sangyô	1-1 Mokuzai-kou Minami, Futukaichi-shi, Hiroshima-ken Tel: 0829-32-3330
Ôkura Kôgyô	1515 Namatu-machi, Marukame-shi, Kagawa-ken 763-0054 Tel: 0877-23-1111

Danya Sangyô	2-5-12 Higashi Minato-machi, Ogurakita-ku, Kitakyushyu-shi, Fukuoka-ken 803-0802 Tel: 093-561-6699
Tônan Sangyô	Tônan Building, 815 Hachioji-machi, Kumamoto-shi, Kumamoto-ken 860-0831 Tel: 096-379-8888

B. Members of Japan Wood Window Association (Japanese Manufacturers)

ISLAND PROFILE Co., Ltd.	2-13-15 Ikegami, Ota-ku, Tokyo 146 Tel: 03-3754-7043
Asahi Glass	Tel: 03-3218-5372
Oide Sangyo Co., Ltd.	4-12-18 Toyo, Koto-ku, Tokyo 135 Tel: 03-3645-9178
Oharasanwa KK	6-4-13 Umeda, Adachi-ku, Tokyo Tel: 03-3889-6601
Kamo Tategu Kyodo Kumiai	16-6 Kotobuki-machi, Kamo-shi, Niigata 959-13 Tel: 0256-52-0893
Kawakami Seisakusho Co., Ltd.	339-22 Kogyo-danchi, Murakami-shi, Niigata 958 Tel: 0254-53-3030
KIMADO Co., Ltd.	1-1 Kami Akae-cho, Toyama-shi, Toyama 930 0764-41-1423
Kyowa Mokko Co., Ltd.	22-2 Owada Minami, Suwa-shi, Nagano 392 Tel: 0266-79-5531
KOSHIYAMA Co., Ltd.	100 Osuga, Kawatogawa, Noshiro-shi, Akita 016 Tel: 0185-54-3214
SEREN Co., Ltd.	17-7-1 Futukaichi-cho, Fukui-shi, Fukui 910 Tel: 0776-55-1675
Taisei Tategu Co., Ltd.	Kakezukuri-cho 9, Wakayama, 640 Tel: 0734-22-2634
Tanaka Tategu	14 Aza-Usui, Futatsui-cho, Yamamoto-gun, Akita, 018-31 Tel: 0185-73-4916
Tanaka Mokuzai Kogyo Co., Ltd.	288-1 Akaike, Nakagawa-cho, Naka-gun, Tokushima, 779-12 Tel: 0884-42-1130
Tokushu Mokuka Kogyo Co., Ltd.	177 Shimomumata-cho, Mumata, Gunma, 378 Tel: 0278-23-2622
TRY WOOD Co., Ltd.	2716 Oaza Kamibaru, Kamitsue-mura, Hita-gun, Oita, 977-03

C. Contacts in Japan

Industry Organisations

The Building Center of Japan	3-2-2 Toranomon, Minato-ku, Tokyo Tel: 03-3434-7155 Fax: 03-3431-3301
Hokkaido Wood Window Association	Sapporo Mokko Center, Hakken 7-9-4-33, Nishi-ku, Sapporo Tel: 011-661-1311
Japan Fire Door Association	Kyodo Bldg. (Minami-Aoyama) 5-11-2, Minami-Aoyama, Minato-ku, Tokyo 107 Tel: 03-3499-0634 Fax: 03-3406-3584
Japan Housing and Wood Technology Center (HOWTEC)	Head Office: Nagata-cho Building, 4th Floor 2-4-3 Nagata-cho, Chiyoda-ku, Tokyo 100 Tel: 03-3581-5582 Fax: 03-3581-5586
Japan Solid Wood Flooring Industry Association, Japan Composite Flooring Industry Association	Mokuzaikaikan 2-5-11 Fukagawa, Koto-ku, Tokyo 135-0033 Tel: 03-3643-2948
Japan Wood Window Association (WWA)	c/o Mokuzô-kôzô-shinkô 3-3-1 Shinsa, Kôtô-ku, Tokyo 136-0075 Tel: 03-3640-8851 Fax: 03-3640-8859
Wood Window Sash Committee	Ohara Sanwa Co., Ltd. 6-4-13 Umeda, Adachi-ku, Tokyo 101

Government Agencies

Building Research Institute (Ministry of Construction)	1 Tatehara, Oho-cho, Tsukuba-shi, Ibaraki, 305 Tel: 0298-64-2151
Ministry of Agriculture, Forestry and Fisheries	Public Relations Office: 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8950 Tel: 81-3-3591-2874 Fax: 81-3-3501-3720
Ministry of Construction	1-3-2 Kasumigaseki, Chiyoda-ku, Tokyo 100 Tel: 03-3580-4311
Ministry of International Trade and Industry (MITI)	1-3-1 Kasumigaseki, Chiyoda-ku, Tokyo 100 Tel: 03-3501-1511 Fax: 03-3501-1317

D. Survey Respondents

GL Home Co.Ltd.	Nisshin Ueno Bldg., 1-5-5 Higashi-Ueno, Taito-ku, Tokyo 110-0015
Hosoda Kôkuten	3-35-21 Asatami-minami, Suginami-ku, Tokyo 166
HW Architectual Design & Construction Inc.	4-43 Showa-cho, Atami-shi, Shizuoka 413
Kawai Kôkuten Co.Ltd.	23-5-2 Minami-cho, Koshigaya-shi, Saitama
Kura Architects and Associates	3-13-20 Toyoshima-ku, Tokyo 171-0031
Mitsui Home Co. Ltd.	4th Floor, Gobancho TM Bldg., 1-11 Gobancho, Chiyoda-ku, Tokyo 102-0076
Penta-Ocean Construction Co.Ltd.	2-8-2 Koraku, Bunkyo-ku, Tokyo 112-8576
Sakura Home	1887-2 Tsuruma, Machida-shi, Tokyo 194
Shônan Create Co.Ltd.	5-43-5 Hatori, Fujisawa-shi, Kanagawa 251-0056
TAK Living	1-1-9 Shinsha, Taito-ku, Tokyo 136-0075
Takenaka Corporation	Tokyo Main Office: 21-1-8 Ginza, Chuo-ku, Tokyo 104-8182
Tôkyu Home Corp.	21-14-1 Dogenzaka, Shibuya-ku, Tokyo 150-0043
Tostem Corp.	2-1-1 Ojima, Koto-ku, Tokyo, 136-8535

E. Survey Questionnaire

Quality and Attributes of Flooring and Windows (Japan)

QUALITY AND INTERIOR FINISH IN GENERAL

1. Which interior finish items do you prefer to be made of wood? Please rank the 3 most preferred items.

Item	Ranking
Moulding	
Flooring	
Wainscoting	
Ceiling	
Windows	
Exterior doors	
Interior doors	
Stairways	
Stair railings	
Cabinet doors	
Kitchen cabinets	
Bathroom cabinets	

2. Would you like to see the wood interior finish products that your company purchases certified by a quality assurance program?

   Which wood products would you prefer to have certified?

3. Given the choice, would you prefer to see a quality assurance program certify quality in the process of manufacturing (how well the product is manufactured), quality in the product (how well the product fulfils its intended function), or would you prefer a quality assurance program certifying both?
   - ☐ quality in the process
   - ☐ quality in the product
   - ☐ both

   (if BOTH) Which is more important to you, quality in the process or quality in the product?
   - ☐ quality in the process
   - ☐ quality in the product

4. If a product you are purchasing were to be certified by a quality assurance program, what differences would you expect over a non-certified product?

WINDOWS

5. What percentage of windows does your company manufacture? From how many suppliers do you purchase windows?

Source	Proportion
make in house	
purchased from 1-2 suppliers	
purchased from 3-5 suppliers	
purchased from 6-10 suppliers	
purchased from >10 suppliers	

6. Which materials does your company use for **windows**? Please indicate the proportions.

Material	Proportion
Aluminium	
Wood	
Aluminium-clad wood	
Vinyl-clad wood	
Vinyl plastic	

8. What are the 3 most important properties when selecting a material for windows?

9. How important are these factors in defining quality for the windows that you purchase? Please rate each factor from 1 to 10 with 1 being not at all important and 10 being extremely important.

Factor	Rating
1. Product performance	
2. Product features	
3. Product reliability	
4. Product conformance	
5. Product durability	
6. Product serviceability	
7. Product aesthetics	
8. Perceived quality	

10. Are there any other quality characteristics you expect in windows that are not on the list?

11. How long should after-sales service be for **windows**? What is the minimum time acceptable and what is the desired time?

12. Do you agree with the following statements made for windows? Please say if you strongly agree, agree, disagree, or strongly disagree with the statements.

Statement	Level of agreement
The quality of the product is an important aspect of the decision to buy one product over another.	
My company receives good value given the price of the products.	
The products my company purchases should be subject to a formal quality control program.	
The quality of the products my company purchases has improved over the last 3 years.	
The quality of the service my suppliers provide has improved over the last 3 years.	

13. Which proportion of the houses your company builds requires fire safety-approved **doors and windows**?

    Of those, which proportion requires type A fire doors (koshu)?

14. When purchasing windows, how important are the following characteristics to you? Are these characteristics extremely important, very important, important, not very important, or not at all important?

Characteristics	Rating
They are approved for use in fire and quasi-fire protection districts.	
There are many different sizes available.	
There is a wide variety of designs available.	
Material and design match the interior design of the house.	
They are soundproof.	
The finishing contains no toxic components.	
They have a high insulation value.	

15. Which window designs does your company install? What are the proportions of these window designs? Are these proportions expected to increase, decrease, or remain the same?

Design	Proportion	Change
Traditional double sliding window		
Casement window		
Double-hung window		
Bay window		
Awning window		
Picture window		

16. Would you consider using wood windows?
    - ☐ yes *(go on to question 18)*
    - ☐ no
    - ☐ don't know

17. Why would you not use wood windows? *(go on to question 25)*

18. Would you like windows with the wood texture visible on the inside of the house?
    - ☐ yes
    - ☐ no

19. Which colour do you prefer on the inside of the house for a window, very light, light, medium, dark or very dark?
    - ☐ very light
    - ☐ light
    - ☐ medium
    - ☐ dark
    - ☐ very dark

20. Which colour do you prefer on the outside of the house for windows, very light, light, medium, dark or very dark?
    - ☐ very light
    - ☐ light
    - ☐ medium
    - ☐ dark
    - ☐ very dark

21. Do you prefer pre-finished or unfinished wood windows?
    - ☐ pre-finished
    - ☐ unfinished

22. Would you allow some knots on windows?
    - ☐ yes
    - ☐ no
    - ☐ depends

    (if YES or DEPENDS) Please describe what kind of knots you would accept.

23. For windows, would you prefer hardwoods or softwoods?
    - ☐ hardwoods
    - ☐ softwoods
    - ☐ doesn't matter
    - ☐ don't know

24. Which species of hardwoods/softwoods do you prefer for windows?

25. Would you use finger-jointed window components?
    - ☐ yes
    - ☐ no
    - ☐ depends
    - ☐ don't know

    (if DEPENDS) On what does it depend whether you would use finger-jointed wood?

26. Would you use laminated window components?
    - ☐ yes
    - ☐ no
    - ☐ depends
    - ☐ don't know

    (if DEPENDS) On what does it depend whether you would use laminated wood?

27. Which material would you prefer for wood windows: wood-only windows, aluminium-clad wood windows, or vinyl-clad wood windows?
    - ☐ wood-only windows
    - ☐ aluminium-clad wood windows
    - ☐ vinyl-clad wood windows

28. The next question on doors and windows does not pertain to any specific material. What are your greatest concerns regarding the quality of windows?

FLOORING

29. Which proportion of flooring does your company manufacture and which proportion do you purchase from suppliers? From how many suppliers do you purchase?

Source	Proportion
make in house	
purchased from 1-2 suppliers	
purchased from 3-5 suppliers	
purchased from 6-10 suppliers	
purchased from >10 suppliers	

30. Which materials does your company use for flooring? Please indicate the proportion for each material you use.

Material	Proportion
Fiberboard core with veneer laminate	
Fiberboard core with non-wood laminate	
Solid hardwood	
Solid softwood	
Thin solid wood on plywood base	
Carpet	
Ceramic tiles	
Linoleum	
Tatami	

31. Which floor materials do you prefer in the following areas of a house?

Areas	Material
Entrance	
Hall	
Living area	
Dining area	
Kitchen	
Bathroom	
Stairway	
Bedroom	

32. How important are these factors in defining quality for the flooring that you purchase? Please rate each factor from 1 to 10 with 1 being not at all important and 10 being extremely important.

Factor	Rating
1. Product performance	
2. Product features	
3. Product reliability	
4. Product conformance	
5. Product durability	
6. Product serviceability	
7. Product aesthetics	
8. Perceived quality	

33. Are there any other quality characteristics you expect in flooring that are not on the list?

34. How long should after-sales service be for flooring? What is the minimum time acceptable and what is the desired time?

35. Do you agree with the following statements made for flooring? Please say if you strongly agree, agree, disagree, or strongly disagree with the statements.

Statement	Level of agreement
The quality of the product is an important aspect of the decision to buy one product over another.	
My company receives good value given the price of the products.	
The products my company purchases should be subject to a formal quality control program.	
The quality of the products my company purchases has improved over the last 3 years.	
The quality of the service my suppliers provide has improved over the last 3 years.	

The following questions pertain to wood flooring only.

36. Which type of wood floor do you prefer, solid hardwood, solid softwood, fibreboard core with veneer laminate, fibreboard core with wood-imitating laminate, or thin solid wood on plywood base? Please rank these materials with number 1 being the most preferred.

Material	Ranking
Solid hardwood	
Solid softwood	
Fibreboard core with veneer laminate	
Fibreboard core with wood imitating laminate	
Thin solid wood on plywood base	

37. Which wood texture do you prefer, flat grain or edge grain?
    - ☐ flat grain
    - ☐ edge grain

38. Which colour of installed floor do you prefer, very light, light, medium, dark or very dark?
    - ☐ very light
    - ☐ light
    - ☐ medium
    - ☐ dark
    - ☐ very dark

39. Do you allow some knots?
    - ☐ yes
    - ☐ no
    - ☐ depends

    (if YES or DEPENDS) Please describe what kind of knots you do accept.

40. What type of finish would you like on wood flooring?

41. What are the most common dimensions of flooring planks you use?

42. When purchasing wood flooring, how important are the following characteristics to you? Are these characteristics extremely important, very important, important, not very important, or not at all important?

	Importance rating
The wood flooring is ready to install.	
The wood is colour-matched.	
The finishing contains no toxic components.	

43. Which 3 characteristics of wood flooring would you pay a premium for?

44. Which 3 characteristics of wood flooring would you expect to get a discount for?

45. This last question is on flooring in general. What are your greatest concerns regarding the quality of flooring?